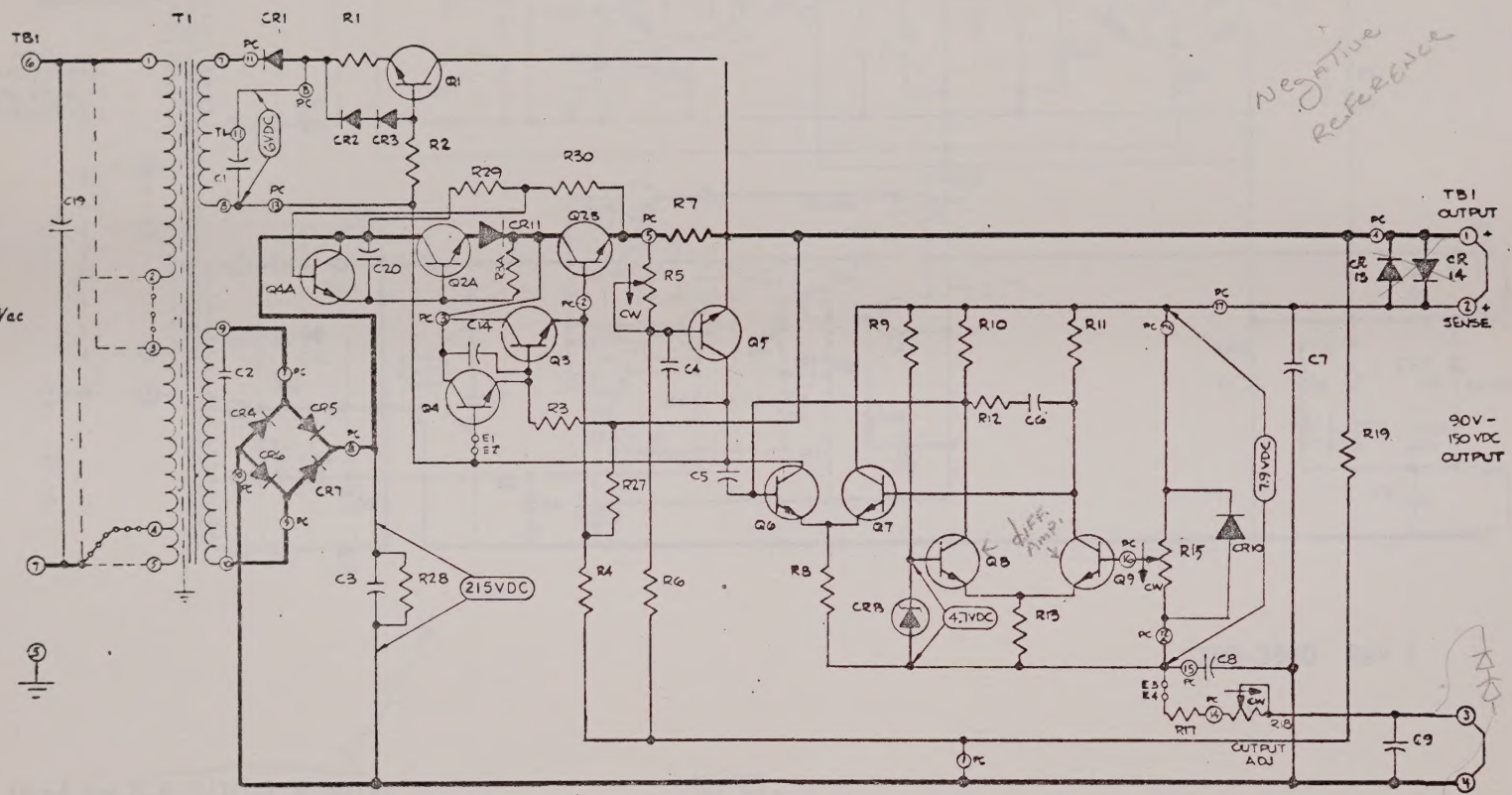
SORENSEN
POWER SUPPLIES

Instruction Manual

Rick's
RIL

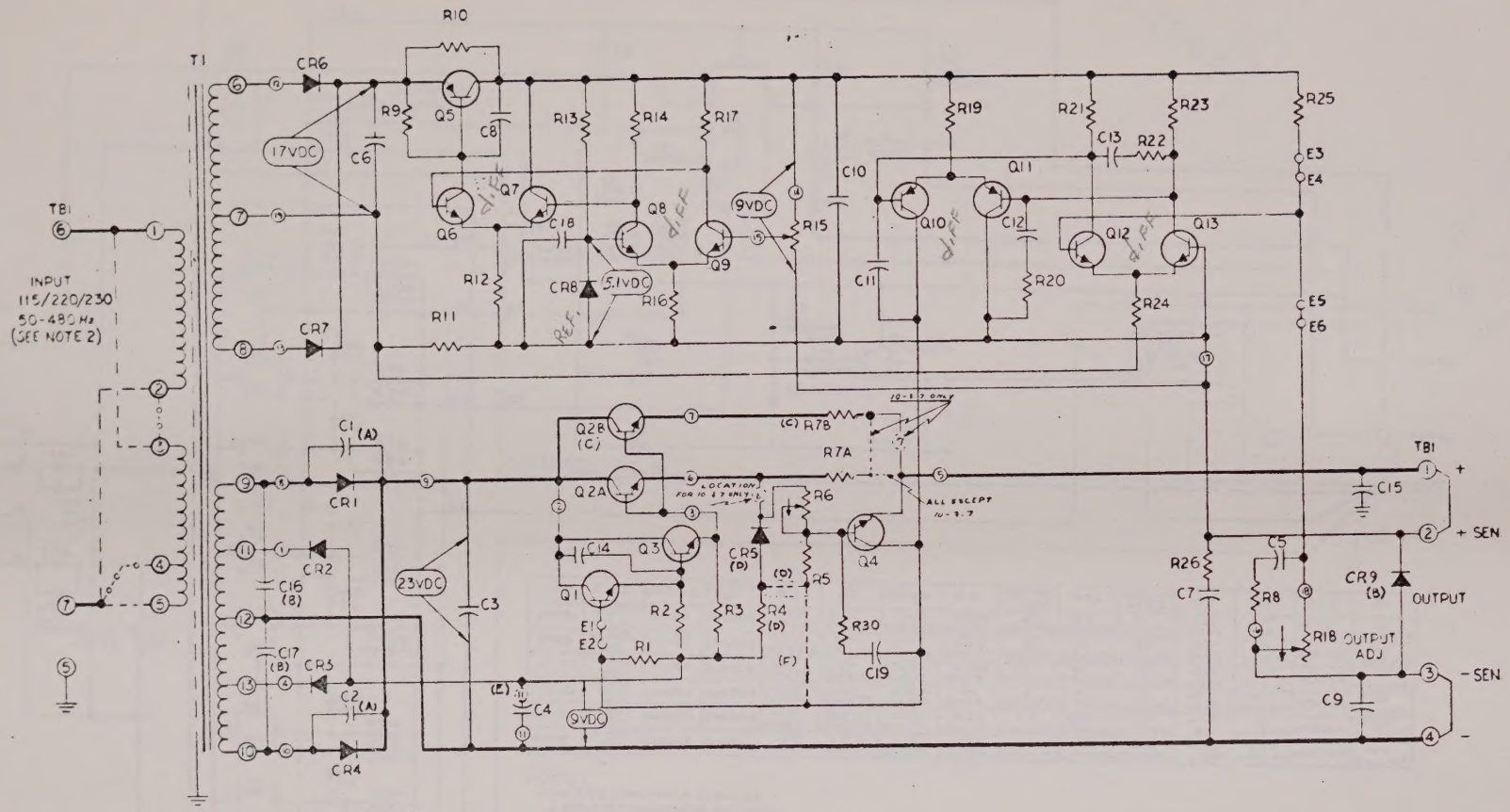
Sorensen Company
676 Island Pond Road
Manchester, N.H. 03103
Tel: 603-668-4500
Twx: 710-220-1339

A Raytheon Company



NOTES:
1. ALL VOLTAGES MEASURED AT NOMINAL INPUT, NOMINAL OUTPUT, NO LOAD
2. SEE FIGURE 2-1 FOR INPUT CONNECTIONS

FIGURE 5-2 C. SCHEMATIC DIAGRAM, 120-VOLT MODEL



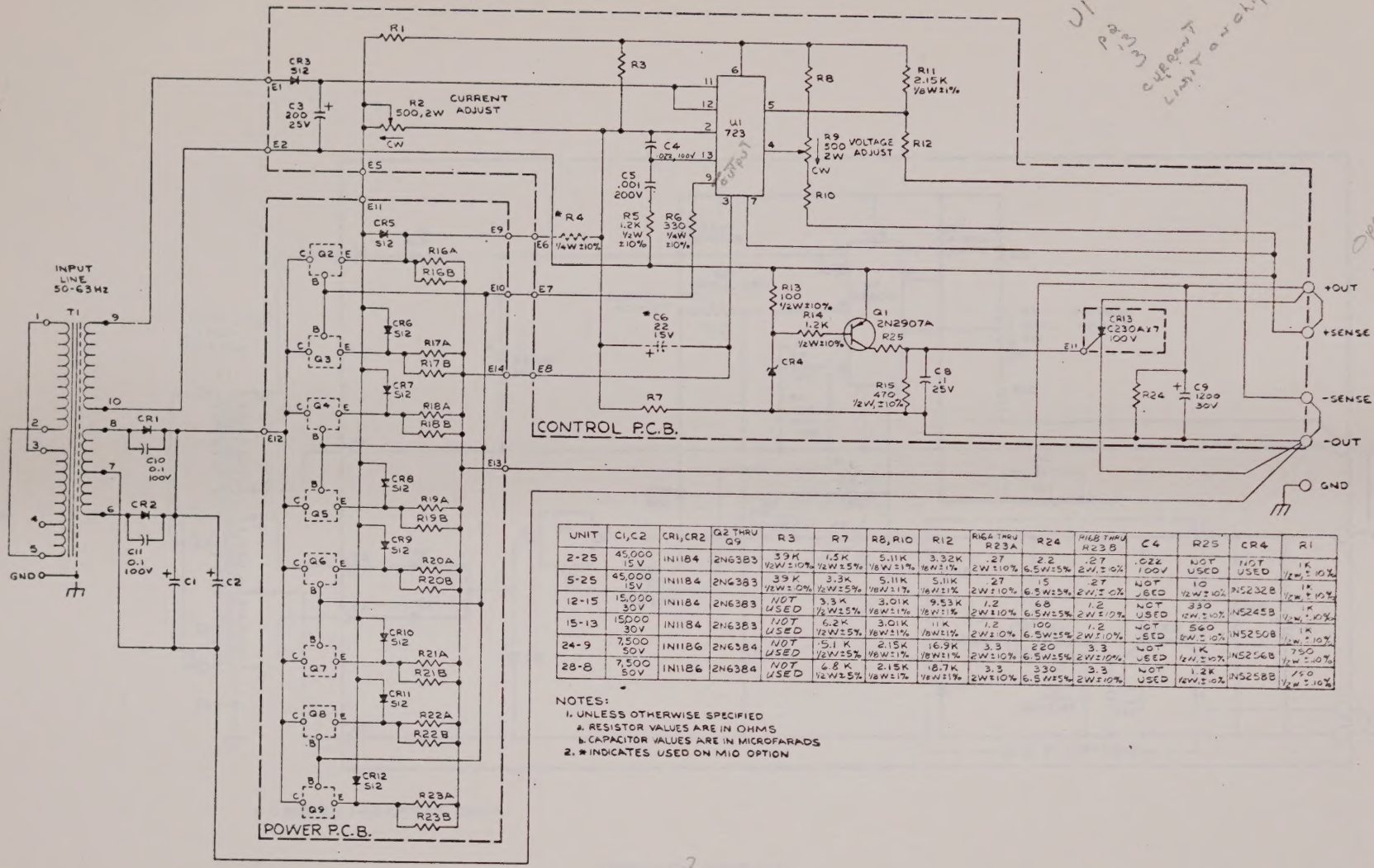
C200-3960 Rev F

(A) Used on 5-6.4/10-1.4 only.
(B) Used on 10-2.2/10-3.7 only.
(C) Not used on 10-1.4.
(D) Not used on 5-6.4.
(E) Terminal used here on 5-6.4/10-3.7 only.
(F) Connection used on 5-6.4 only.

NOTES:

1) All voltages measured at nominal input, nominal output, no load.
2) See Figure 2-1 for input connections.

Figure 5-3 Schematic Diagram QSA RANGER

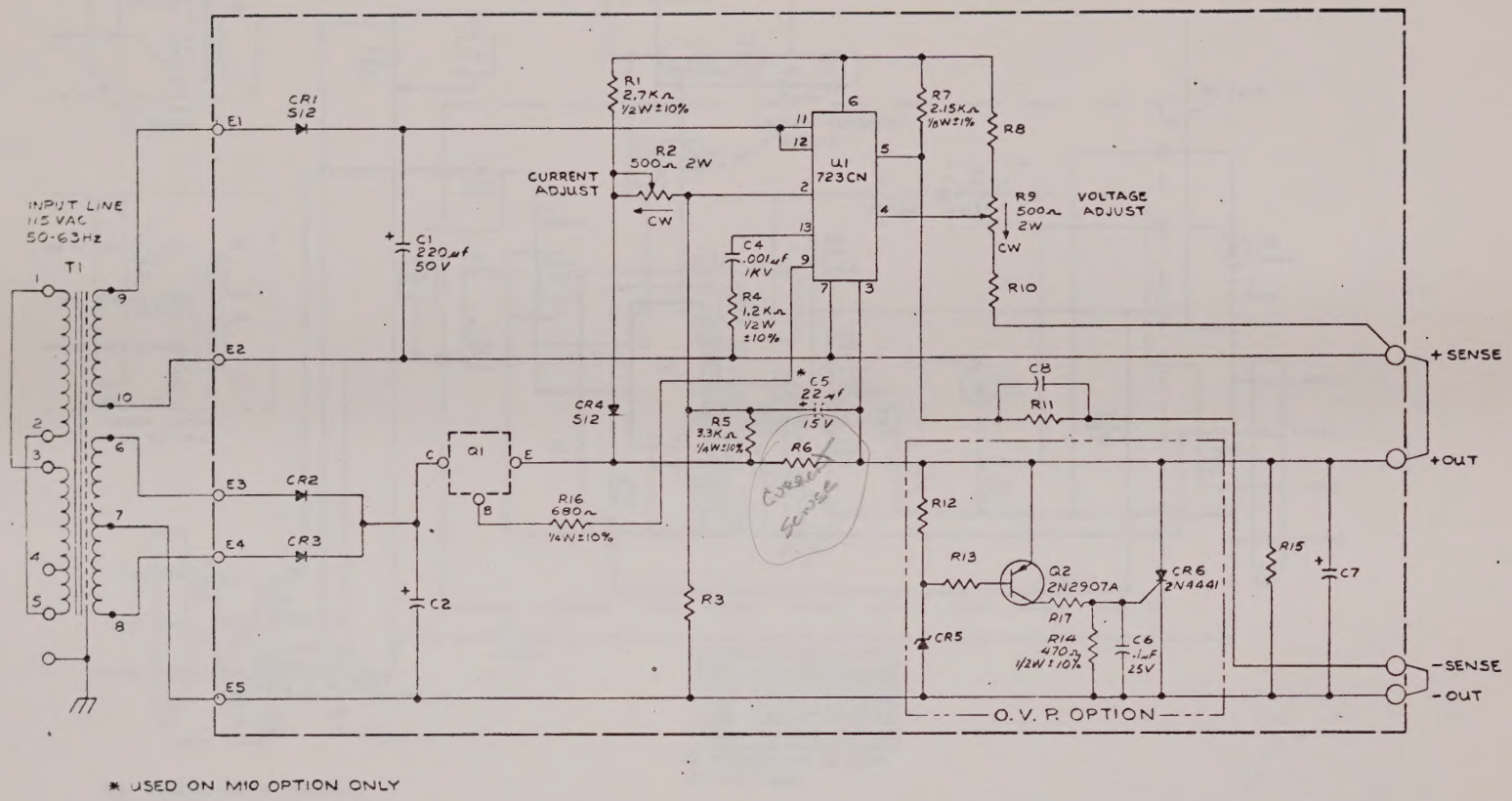


UNIT	C1,C2	CR1,CR2	Q2 THRU Q9	R3	R7	R8,R10	R12	R16A THRU R23A	R24	R16B THRU R23B	C4	R25	CR4	R1
2-25	45,000 15V	IN1184	2N6383	39K 1/2W ±10%	1.5K 1/2W ±5%	5.11K 1/8W ±1%	3.32K 1/8W ±1%	.27 2W ±10%	2.2 6.5W ±5%	.27 2W ±10%	.022 100V	NOT USED	NOT USED	1K 1/2W ±10%
5-25	45,000 15V	IN1184	2N6383	39K 1/2W ±0%	3.3K 1/2W ±5%	5.11K 1/8W ±1%	5.11K 1/8W ±1%	.27 2W ±10%	15 6.5W ±5%	.27 2W ±10%	NOT USED	10 1/2W ±10%	IN5232B	1K 1/2W ±10%
12-15	15,000 30V	IN1184	2N6383	NOT USED	3.3K 1/2W ±5%	3.01K 1/8W ±1%	9.53K 1/8W ±1%	1.2 2W ±10%	68 6.5W ±5%	1.2 2W ±10%	NOT USED	330 1/2W ±10%	IN5245B	1K 1/2W ±10%
15-13	15,000 30V	IN1184	2N6383	NOT USED	6.2K 1/2W ±5%	3.01K 1/8W ±1%	11K 1/8W ±1%	1.2 2W ±10%	100 6.5W ±5%	1.2 2W ±10%	NOT USED	560 1/2W ±10%	IN5250B	1K 1/2W ±10%
24-9	7,500 50V	IN1186	2N6384	NOT USED	15.1K 1/2W ±5%	2.15K 1/8W ±1%	16.9K 1/8W ±1%	3.3 2W ±10%	220 6.5W ±5%	3.3 2W ±10%	NOT USED	1K 1/2W ±10%	IN5256B	750 1/2W ±10%
28-8	7,500 50V	IN1186	2N6384	NOT USED	6.8K 1/2W ±5%	2.15K 1/8W ±1%	18.7K 1/8W ±1%	3.3 2W ±10%	330 6.5W ±5%	3.3 2W ±10%	NOT USED	1.2K 1/2W ±10%	IN5258B	750 1/2W ±10%

NOTES:
1. UNLESS OTHERWISE SPECIFIED
   a. RESISTOR VALUES ARE IN OHMS
   b. CAPACITOR VALUES ARE IN MICROFARADS
2. * INDICATES USED ON M10 OPTION

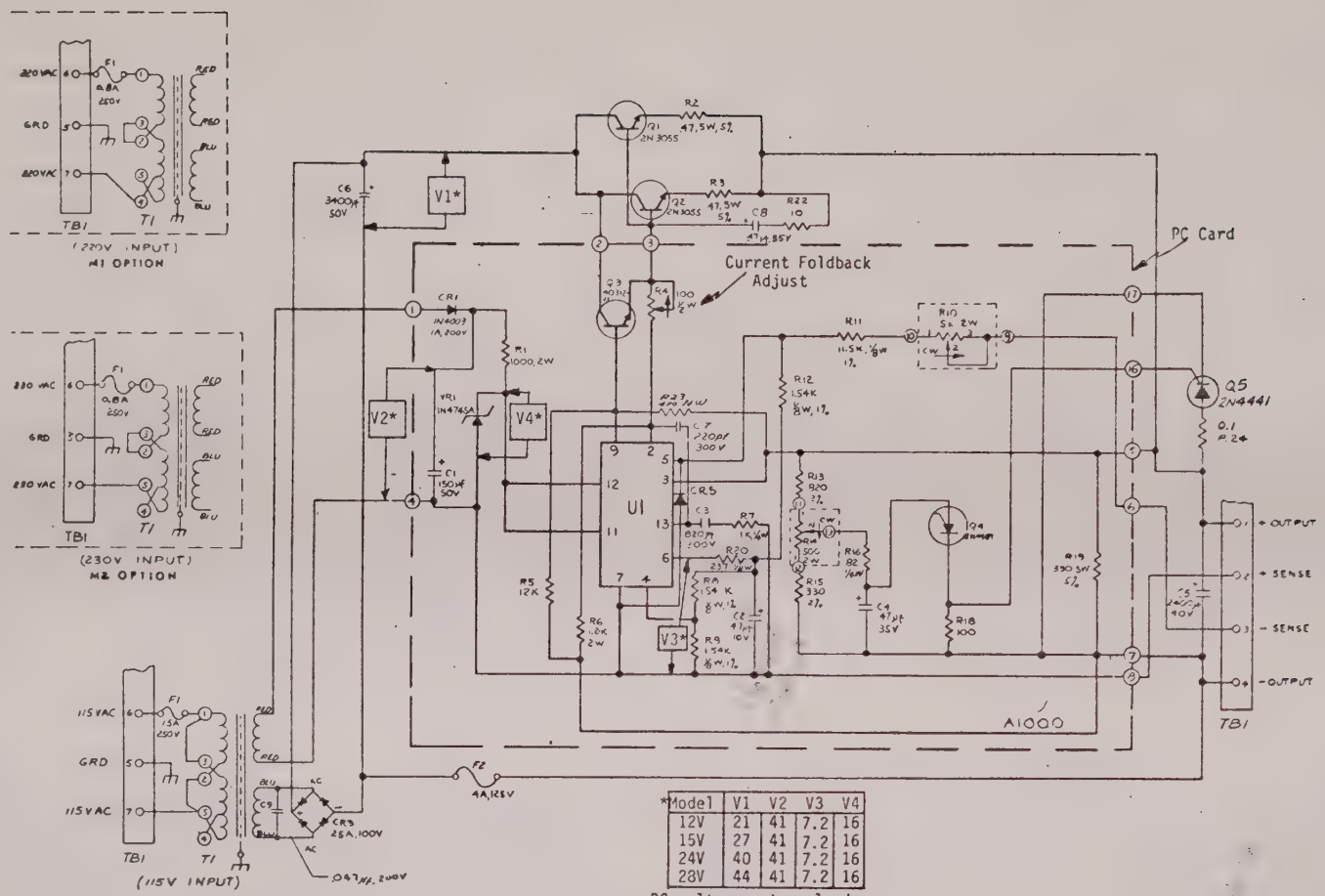
Dwg. D167485 Rev. E

SOC Module F Series Schematic Diagram



* USED ON M10 OPTION ONLY

SORENSEN COMPANY
SOC MODULE "A" SERIES
OPEN CHASSIS POWER SUPPLIES
Dwg D166499 Rev. F

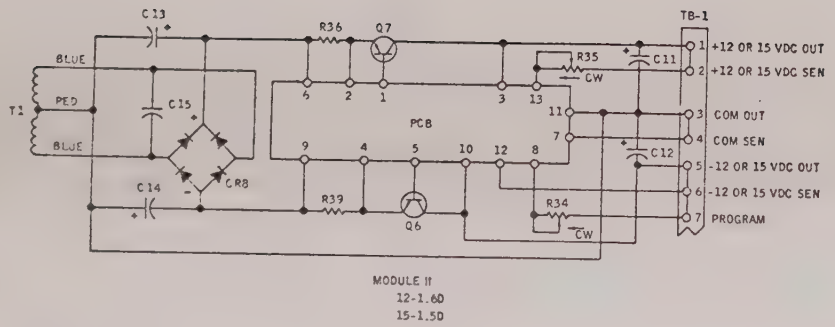


Dwg. D586096 Rev. M (Special)

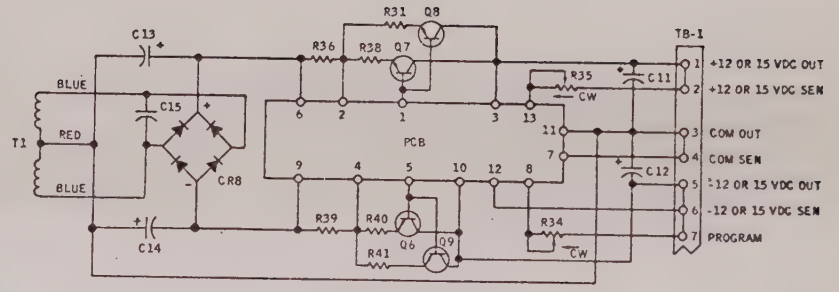
*Model	V1	V2	V3	V4
12V	21	41	7.2	16
15V	27	41	7.2	16
24V	40	41	7.2	16
28V	44	41	7.2	16

DC voltages at no load, 115-VAC input

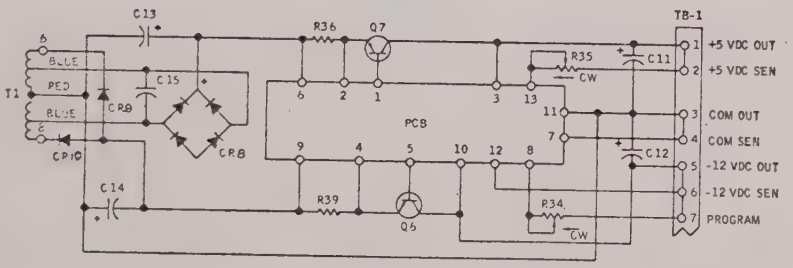
Figure 5-1 (B) - Typical 12V, 15V, 24V, 28V Schematic Diagram (Module II)



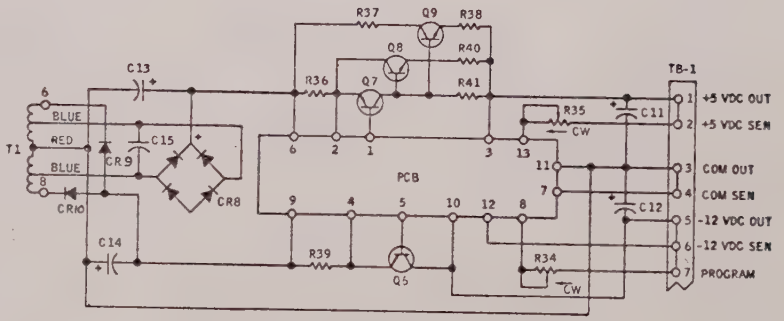
MODULE II
12-1.6D
15-1.5D



MODULE III
12-3D
15-2.8D



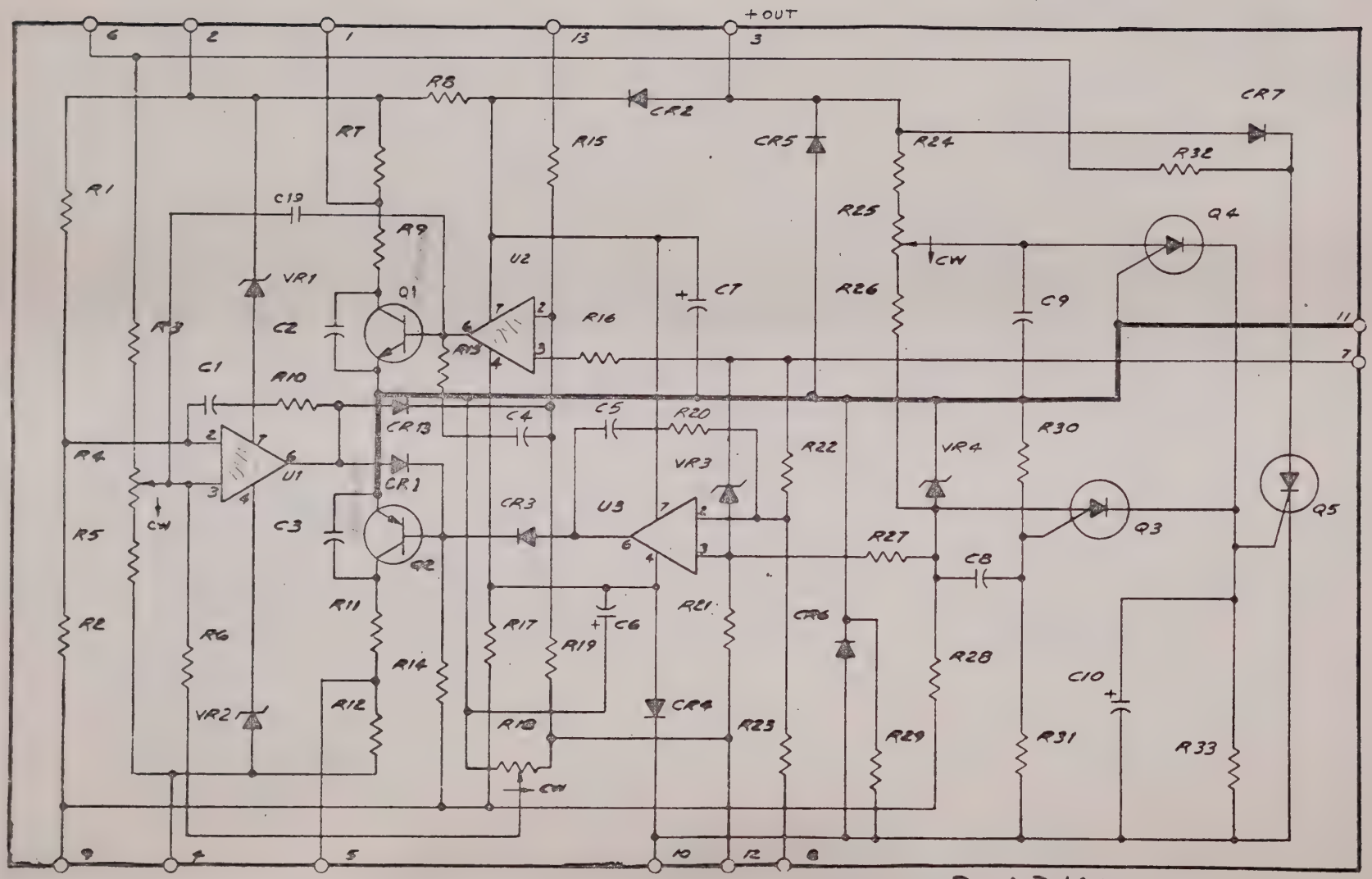
MODULE II
5/12 D2



MODULE III
5/12D3

Figure 5-1 Partial Schematic Diagrams

PTM DUAL



PTM DUAL

Figure 5-2A Typical PC Card Schematic

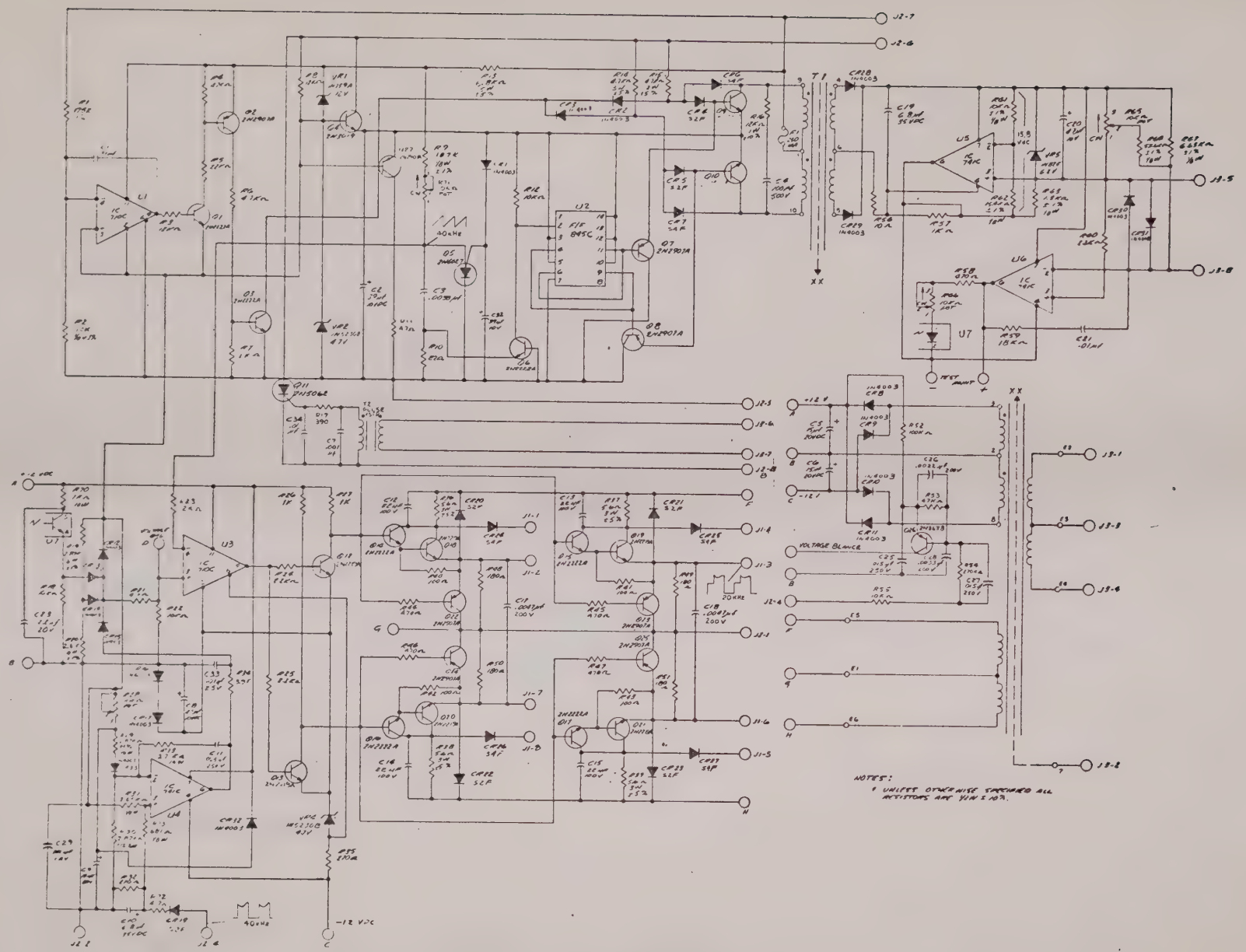


Figure 5-6B Printed Circuit Board
A100 Schematic Diagram STM 5-100

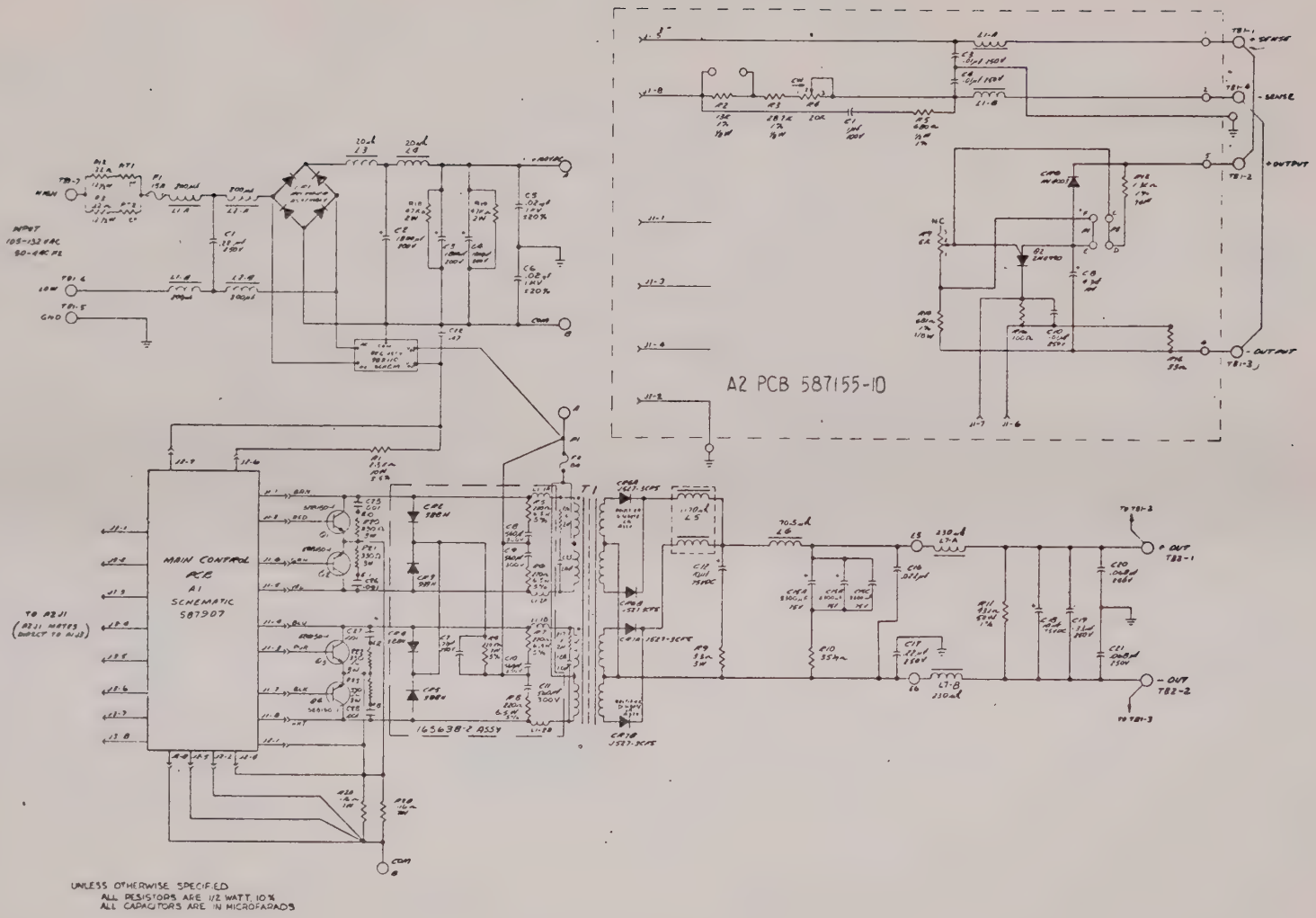

A2 PCB 587155-10
MAIN CONTROL PCB A1 SCHEMATIC 587907
UNLESS OTHERWISE SPECIFIED
ALL RESISTORS ARE 1/2 WATT 10%
ALL CAPACITORS ARE IN MICROFARADS

Figure 5-3 STM Units Typical Schematic Diagram S-100

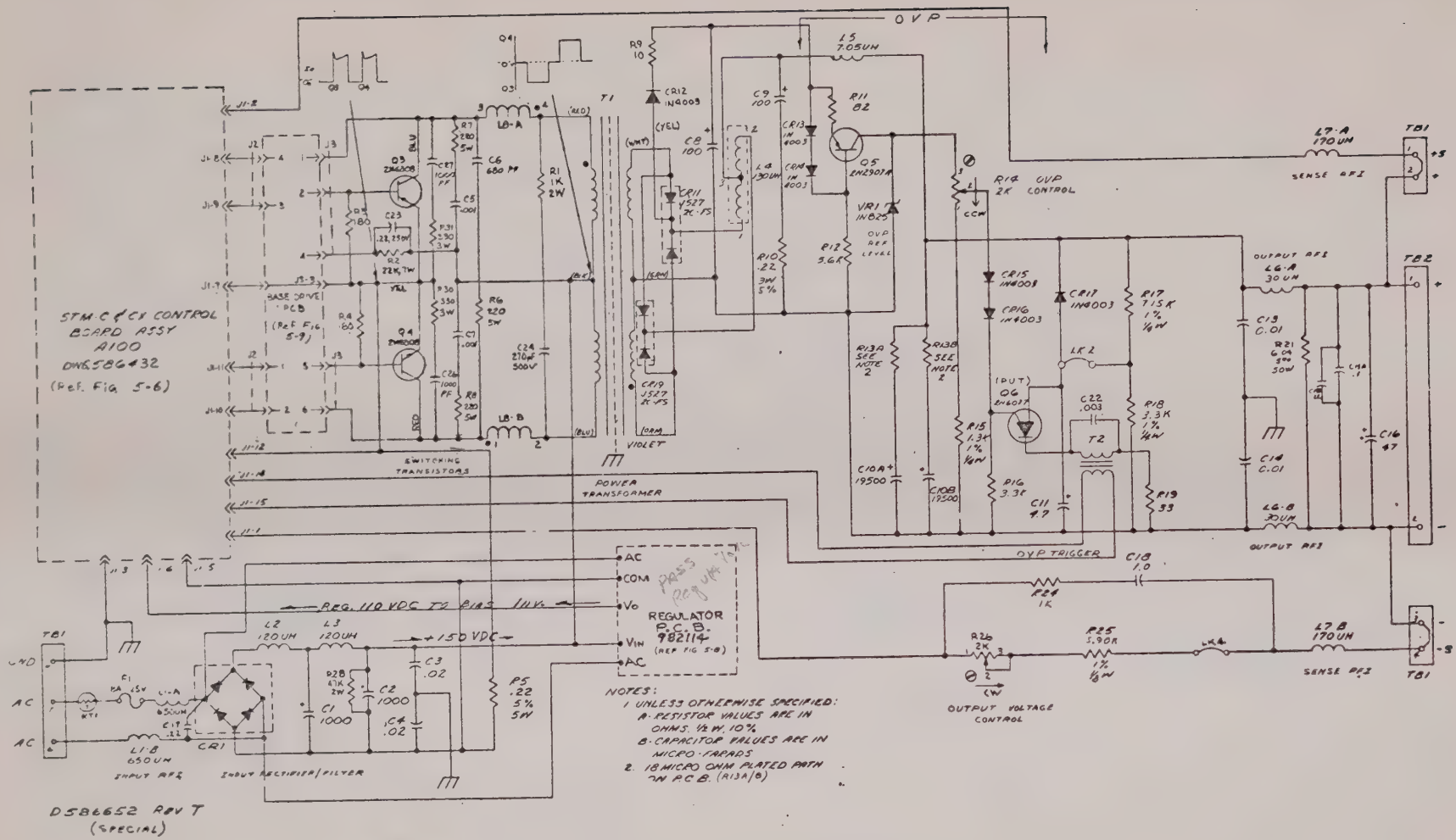

OVP
STM-C & CX CONTROL BOARD ASSY A100 DWG 586432 (Ref. Fig 5-6)
BASE DRIVE PCB (Ref. Fig 5-9)
SWITCHING TRANSISTORS
POWER TRANSFORMER
OVP TRIGGER
REG. 110 VDC TO BIAS INV.
+150 VDC
REGULATOR P.C.B. 982114 (REF FIG 5-8)
PASS REQUIRED
INPUT RECTIFIER/FILTER
OUTPUT VOLTAGE CONTROL
SENSE REF
OUTPUT REF
D586652 REV T (SPECIAL)
NOTES:
1. UNLESS OTHERWISE SPECIFIED:
A. RESISTOR VALUES ARE IN OHMS. ½ W, 10%
B. CAPACITOR VALUES ARE IN MICRO-FARADS
2. 1B MICRO OHM PLATED PATH ON P.C.B. (R13A/B)

FIGURE 5-3
STM 3-12 VOLT UNITS
TYPICAL SCHEMATIC DIAGRAM
(MODULE 111A SHOWN)

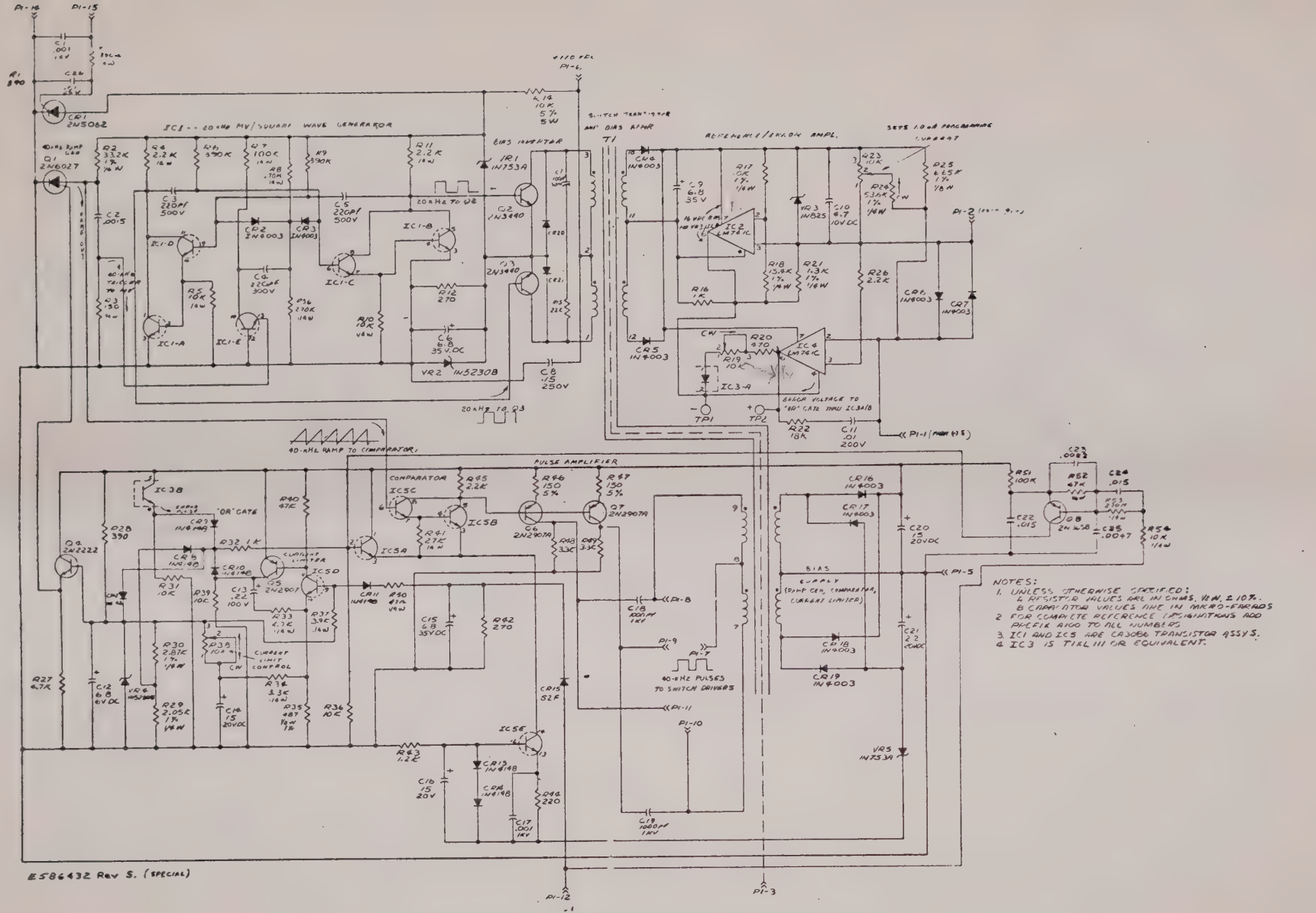
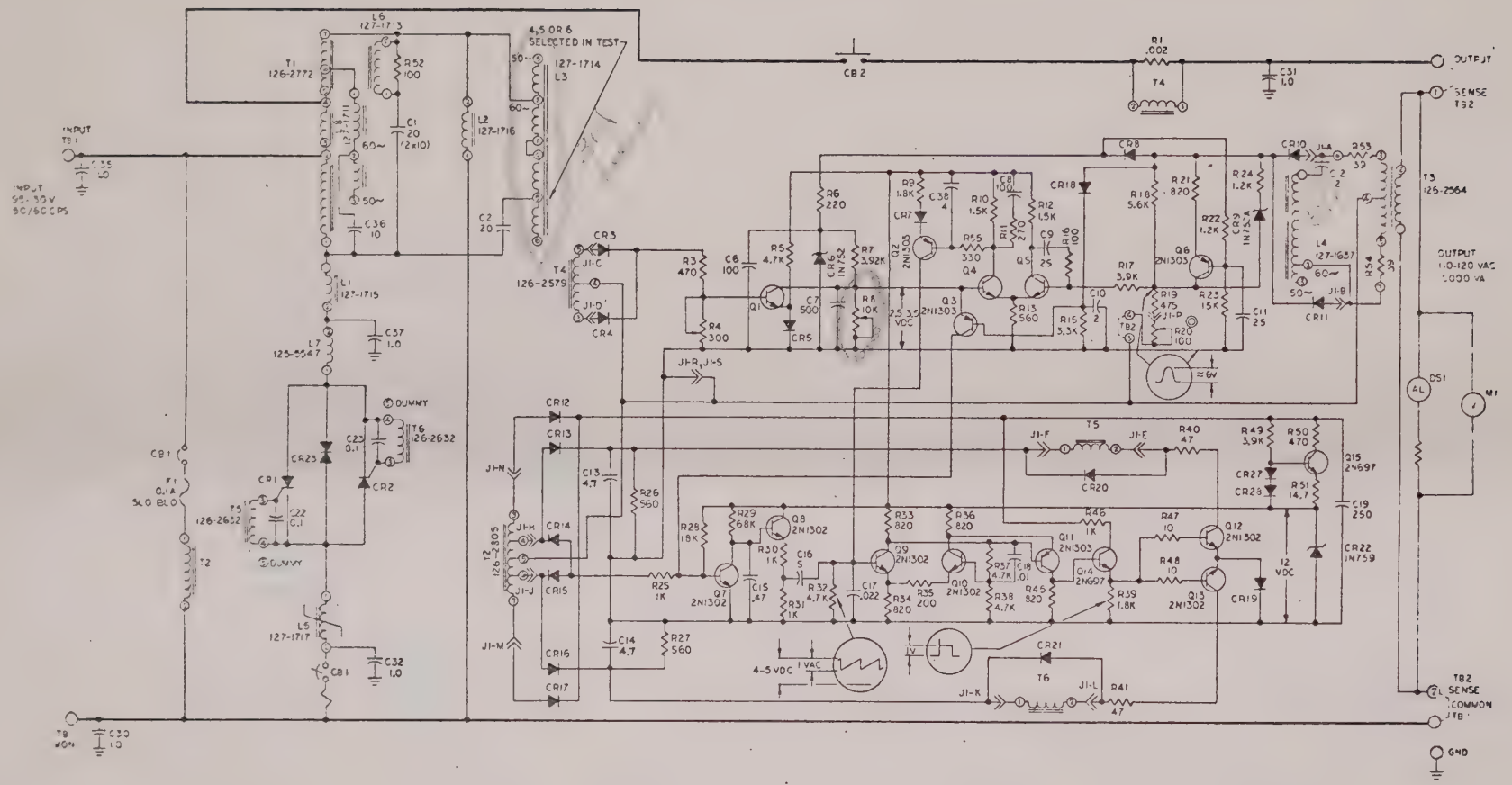
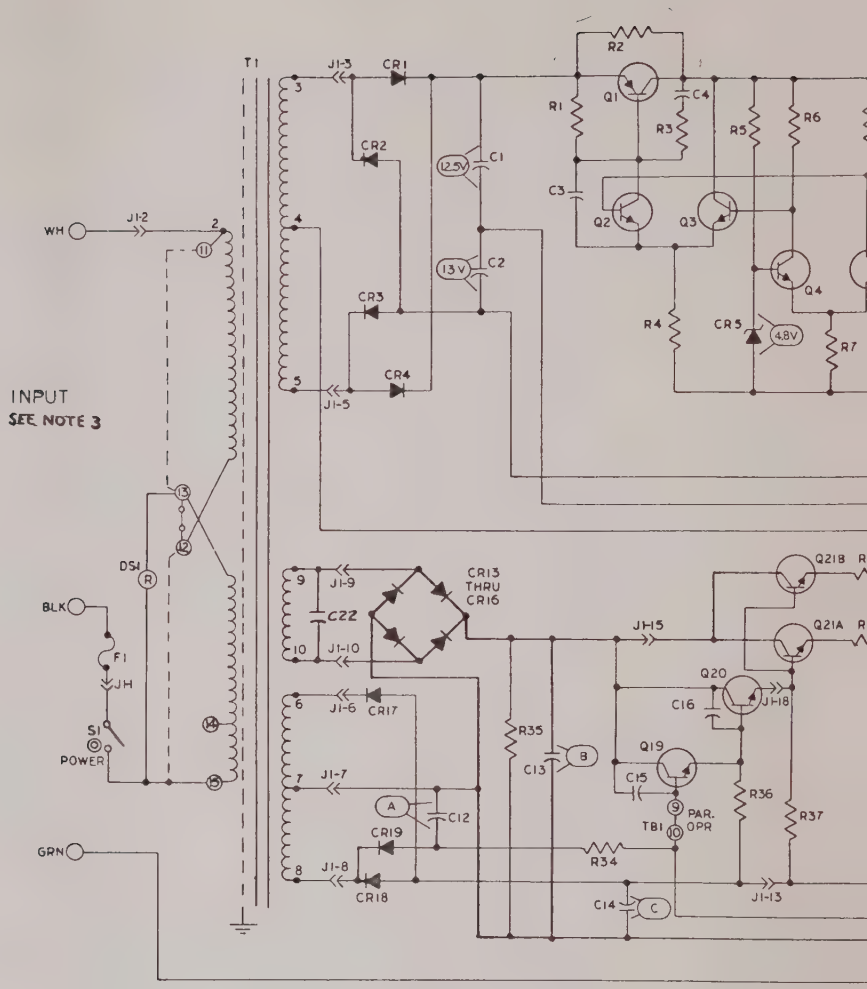

IC1 -- 20 kHz MV/SQUARE WAVE GENERATOR
SWITCH TRANSISTOR AND BIAS REGR
REFERENCE/ERROR AMPL.
SETS 1.0 dB PROGRAMMING CURRENT
20 kHz TO Q2
20 kHz TO Q3
40-kHz RAMP TO COMPARATOR
PULSE AMPLIFIER
COMPARATOR
"OR" GATE
CURRENT LIMITER
CURRENT LIMIT CONTROL
BIAS SUPPLY (RAMP GEN, COMPARATOR, CURRENT LIMITER)
40-kHz PULSES TO SWITCH DRIVERS
ERROR VOLTAGE TO "ER" GATE THRU IC3A/B
NOTES:
1. UNLESS OTHERWISE STATED:
A RESISTOR VALUES ARE IN OHMS, ¼W, ± 10%.
B CAPACITOR VALUES ARE IN MICRO-FARADS
2. FOR COMPLETE REFERENCE DESIGNATIONS ADD PREFIX A100 TO ALL NUMBERS
3. IC1 AND IC3 ARE CA3086 TRANSISTOR ASSYS.
4. IC3 IS TI XL111 OR EQUIVALENT.
E586432 Rev S. (SPECIAL)

FIGURE 5-6B
(A100) PRINTED CIRCUIT BOARD SCHEMATIC STM 5-24
(MODULES 111/111A)



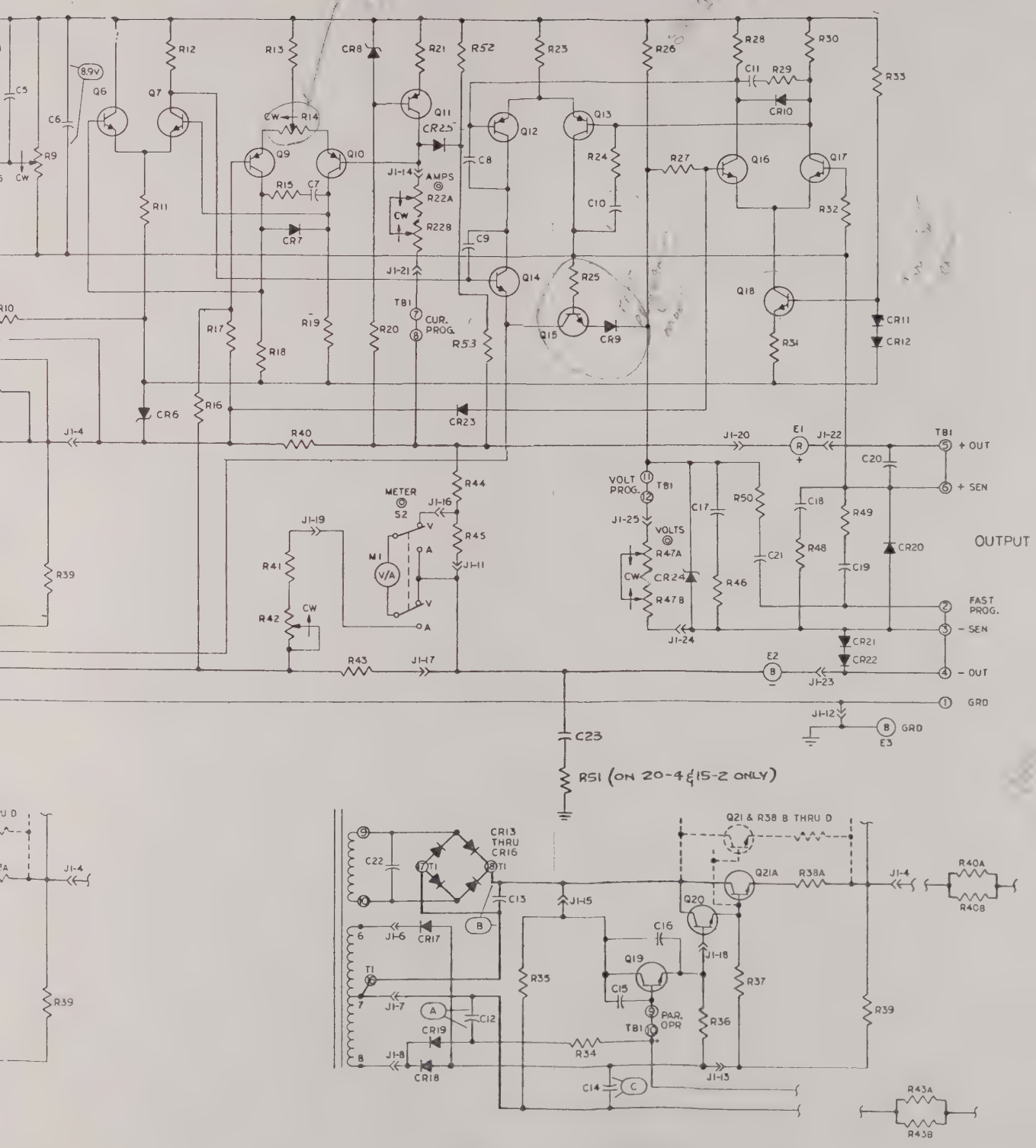
NOTES:
1. ALL VALUES EXPRESSED IN OHMS OR MICROFARADS UNLESS OTHERWISE SPECIFIED.
2. ⊛ DENOTES FRONT PANEL CONTROL.

Figure 5-1C, ACR 10000 Schematic Diagram
(Typical ACR 7500, 15000)



MODEL	VOLTAGE		
	A	B	C
15-2	21	31	19
30-1	42	53	39
40-.75	49	71	46
60-.5	69	98	67
20-4	25	36	22
40-2	49	66	46
60-1.5	69	88	67

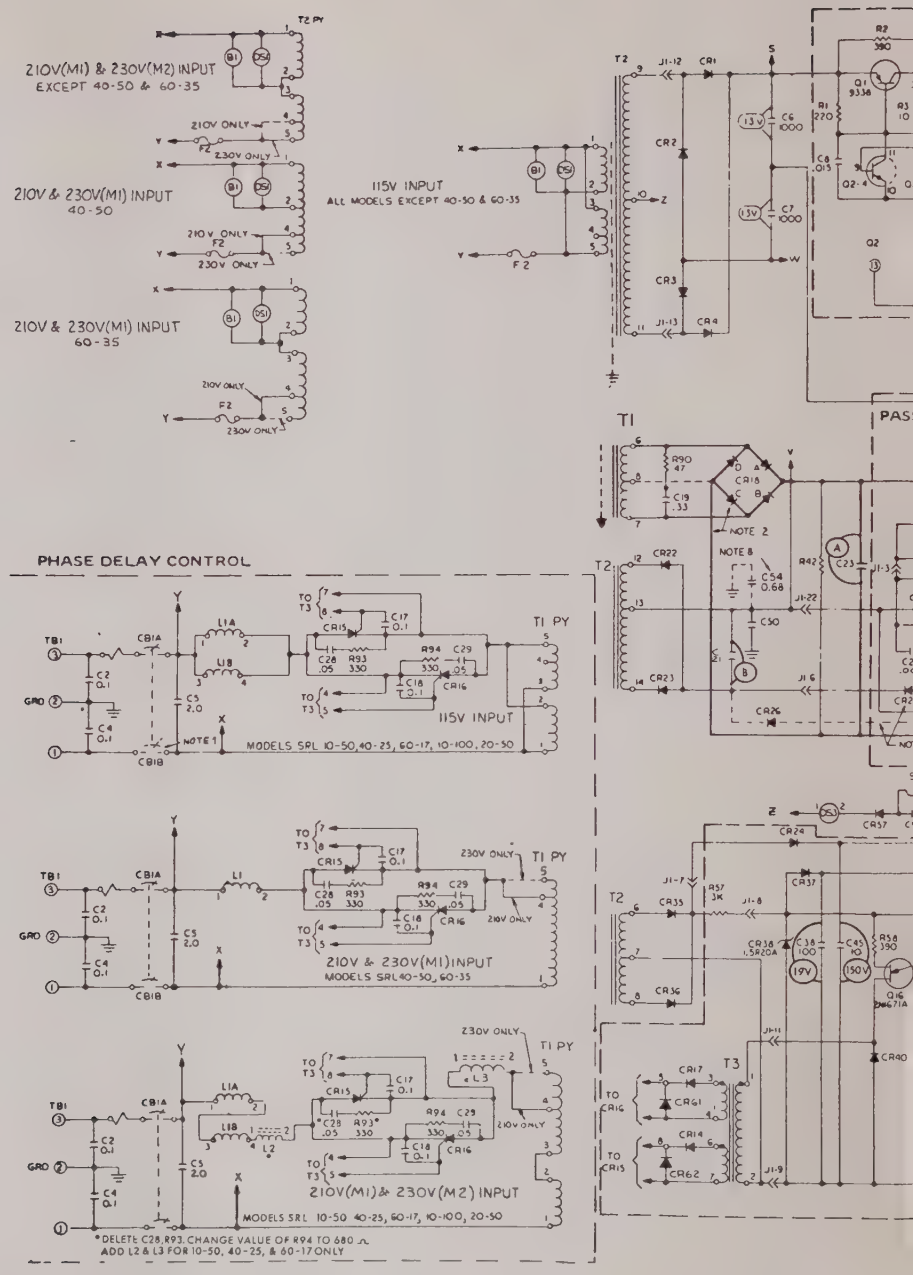
POWER CIRCUIT MODELS QRD40-2 & 60-1.5



POWER CIRCUIT MODEL QRD20-4

NOTES
1. ALL VOLTAGES MEASURED AT NO LOAD, FULL OUTPUT VOLTAGE AND NOMINAL INPUT
2. ⓒ DENOTES FRONT-PANEL CONTROL
3. SEE FIG. 2-3 FOR INPUT-CONNECTION DETAILS

FIGURE 5-3. SCHEMATIC DIAGRAM

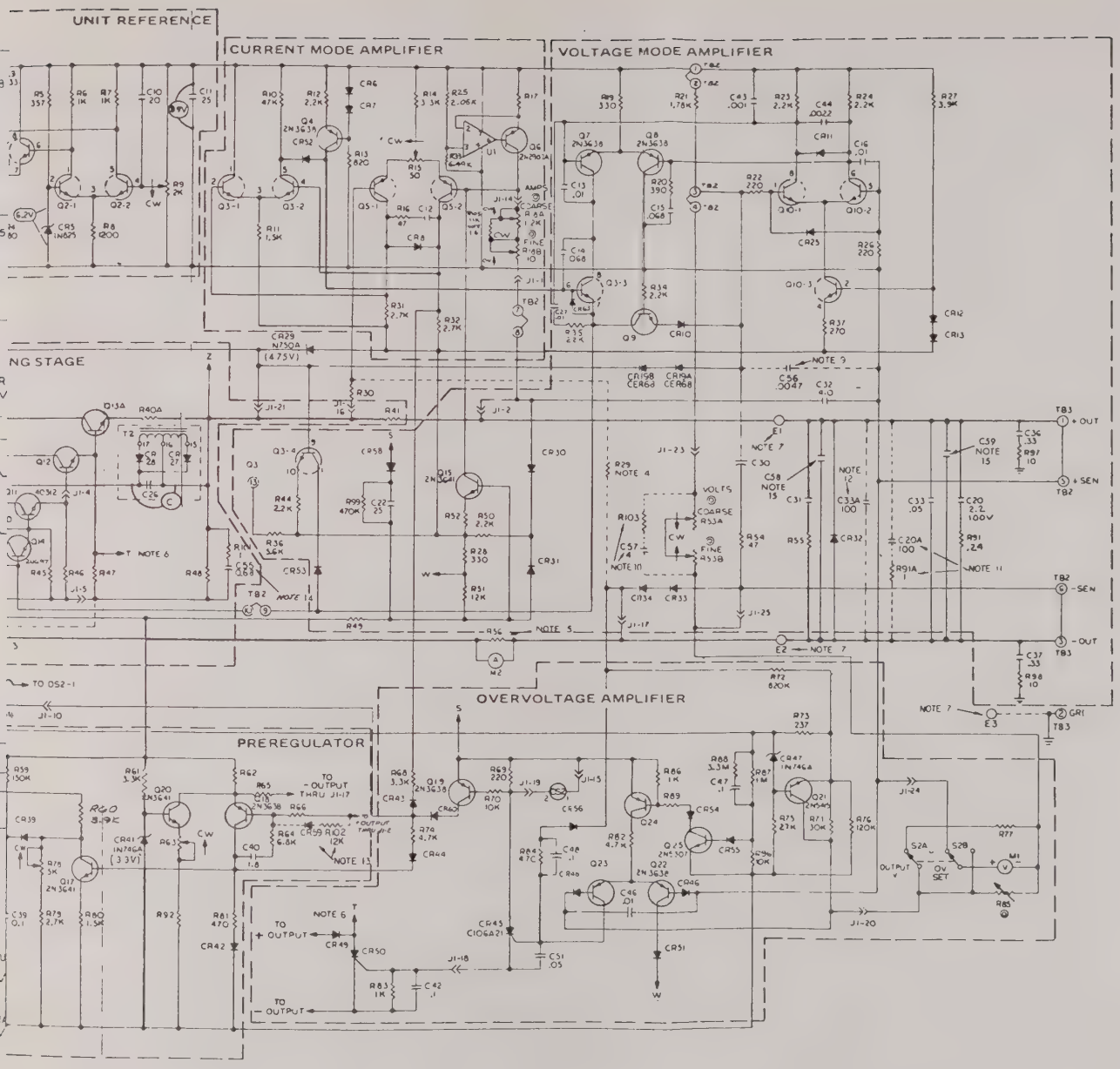


*SELECTED FOR VOLTAGE BREAKDOWN CHARACTERISTICS

UNIT	C12	C13	C 21	C 23	C60	C25	C 26	C 30	C 31	C 50	Q 9	Q 12	Q 13	Q 23	Q 24
10-50	.22	.01	15K	7 X 69K	.047	.001	9.6K	.01	6.4K	0.15	2N 697	2N 3055	2N 3771 (4)	2N 3638	2N 3638
10-100	.22	.01	23K	8 X 85K	.047	.001	21K	.015	26K	.33	2N 697	2N 3771	2N 3771 (7)	2N 3638	2N 3638
20-50	.1	.01	15K	7 X 26K	.01	.001	9.6K	.0033	6.7K	.33	2N 697	2N 3055	2N 3771 (5)	RCA62490	RCA62490
40-25	.1	.01	4.7K	6 X 9.4K	.01	.001	9.6K	.0022	3.2K	0.15	2N 697*	2N 3055	2N 3055 (4)*	RCA62490	RCA62490
40-50	.1	.01	8.7K	6 X 21K	.01	.001	21K	.0022	5.8K	.33	2N 697*	2N 3055	2N 3055 (8)*	RCA62490	RCA62490
60-17	.1	.01	4.7K	4 X 6.5K	.01	.001	9.6K	.001	2.5K	0.33	40321	2N 3055	2N 3442 (4)	RCA62490*	RCA62490*
60-35	.1	.01	4.7K	8 X 6.5K	.01	.001	21K	.0022	6.5K	.33	40321	2N 3055	2N 3442 (8)	RCA62490*	RCA62490*

UNIT	R 41	R 42	R 45	R 46	R 47	R 48	R 49	R 52	R 53A	R 53B	R 55	R 56	R 62	R 63	R 65	R 66	R 77	R 85
10-50	.008	5	1.2K	1.2K	220	3	18K	12K	2K	20	.02	60A	470	1K	4.7K	5.6K	12.1K	3K
10-100	.0025	3	1.2K	1.2K	125	1.0	18K	20K	2K	20	.015	120A	470	1K	4.7K	5.6K	12.1K	3K
20-50	.008	10	1.2K	1.2K	150	2	33K	12K	4K	40	.055	60A	680	1K	12K	10K	24.9K	4K
40-25	.020	25 (2) ser.	2.2K	2.2K	390	10	33K	9K	8K	80	.14		820	1K	22K	18K	49.9K	8K
40-50	.008	50 (2) par.	2.2K	2.2K	180	5	33K	11K	8K	80	.055	60A	820	1K	22K	18K	49.9K	8K
60-17	.040	50 (2) ser.	2.2K	2/2K	300	15	47K	7.5K	12K	120	.185		1K	400	33K	27K	80.6K	12K
60-35	.015	100 (2) par.	2.2K	2.2K	150	10	47K	10K	12K	120	.120	40A	1K	400	33K	27K	80.6K	12K

DWG. E586246—REV. H



17	R 29	R 30	R 40	C39
36K		0	.18(8)	
66K		0	.18(14)	.22
36K		0	.1(5)	.22
32K	2.49M	1	.18(4)	.22
36K		0	.18(8)	.22
16K	2M	1	.33(4)	.22
12K		0	.33(8)	.22

89	R 92	R 103	R59
K	150		
K	150	3.3K	68K
K	100		68K
K	100		68K
K	100		68K
K	100		68K
K	100	6.8K	68K

Notes:

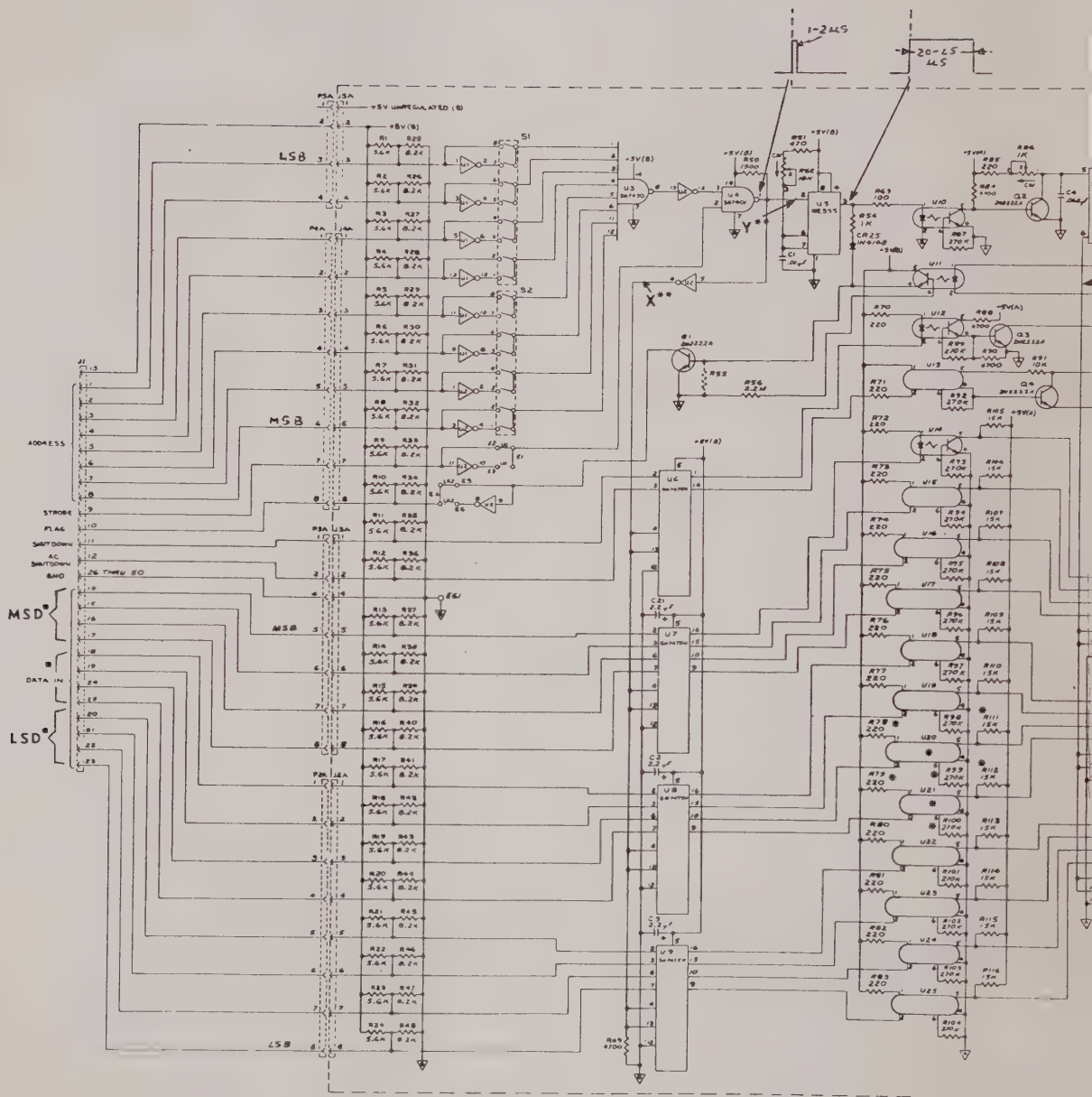
1. CB 1-8 used only on 10-100 and 20-50 (115 input) of this group.
2. CR18C and D not used on 20-50, 10-50, 10-100 and indicated lead is wired to T 1-8.
3. CR26 relocated to dotted position on models 10-50, 10-100, 20-50 and 40-50.
4. R29 not used on 10-50, 10-100, 20-50, 40-50, 60-35.
5. Shunt R56 used on units 35 amp output and up.
6. CR49 inserted and indicated lead "T" used only on 40-25, 40-50, 60-17 and 60-35.
7. E1, E2 and E3 not used on models 20-50, 40-50, 60-35, and 10-100.
8. C54 used only on 10-50, 40-25 and 60-17.
9. C56 used only on 10-100 and 40-50.
10. C57 and R103 used only on 10-100, 60-35.
11. C20A and R91A used only on 20-50.
12. C33A used only on 40-50 and 10-100.
13. CR59 and R102 used only on 60-17 and 60-35.
14. C55 is 20 μF/200V and R101 is short circuit for model SRL 40-25
15. Add C58 and C59 for 10-50, 40-25, 60-17 only (M1 & M2)
16. R105 MAY BE OMITTED IN SOME UNITS, AS DETERMINED BY TEST LIMITS.

UNIT	F2 115V	F2 210V	F2 230V
10-50	2.0A SB	1½A SB	1¼A SB
10-100	4.0A SB	2½A SB	2½A SB
20-50	2.0A SB	1½A SB	1¼A SB
40-25	2.0A SB	1.0A SB	1.0A SB
40-50		2½A SB	2½A SB
60-17	1.5A	1A	1A
60-35		1¼A SB	1¼A SB

VOLTAGE CHART

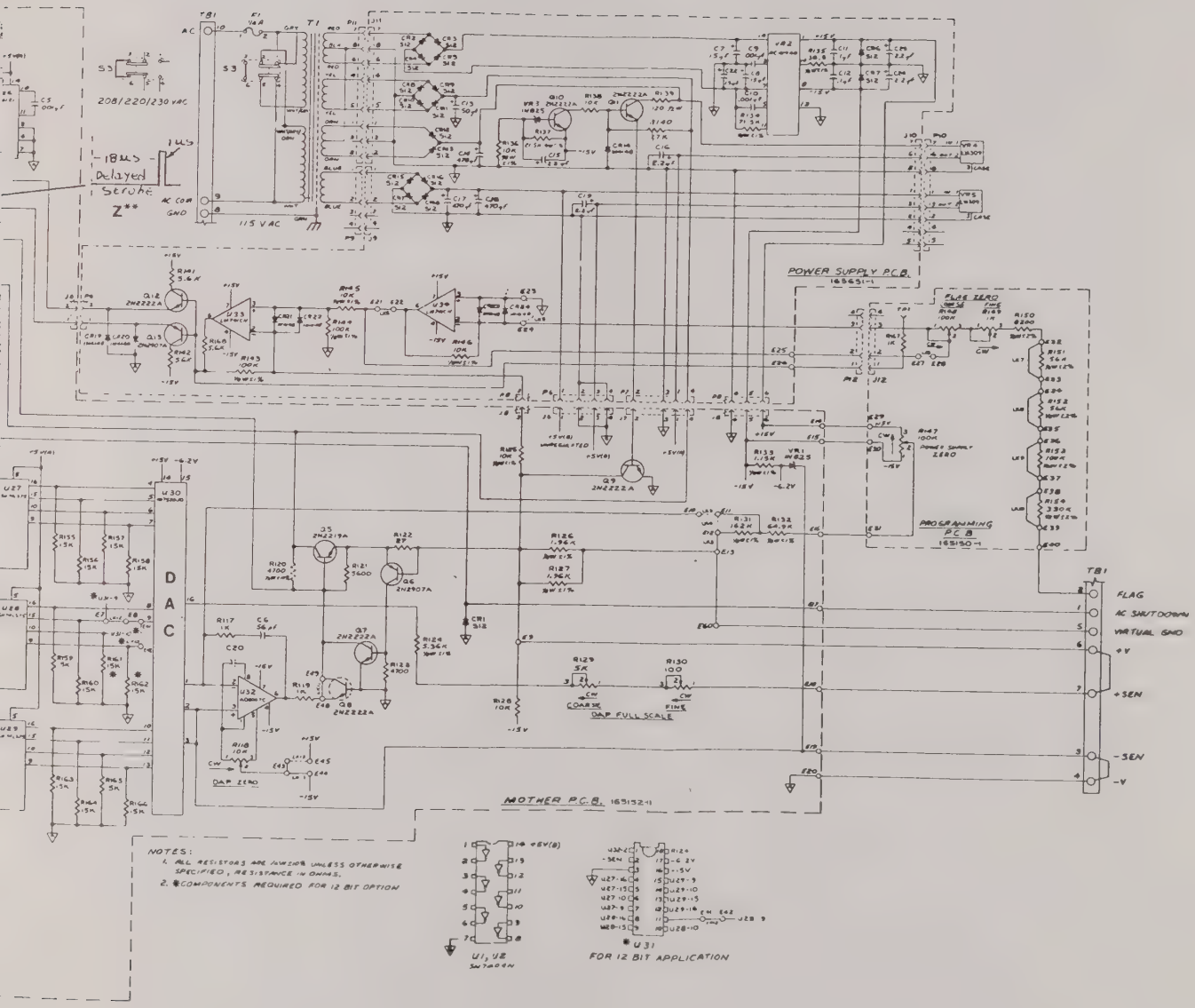
MODEL	A (C23)	B (C21)	C (C26)
10-50	15.5	14	11
10-100	15.5	14	11
20-50	27.0	14	11
40-25	50.0	27	9
40-50	48.5	27	9
40-17	73.7	27	9
40-35	73.4	27	9

FIGURE 6-2
SCHEMATIC DIAGRAM
SRL POWER SUPPLIES



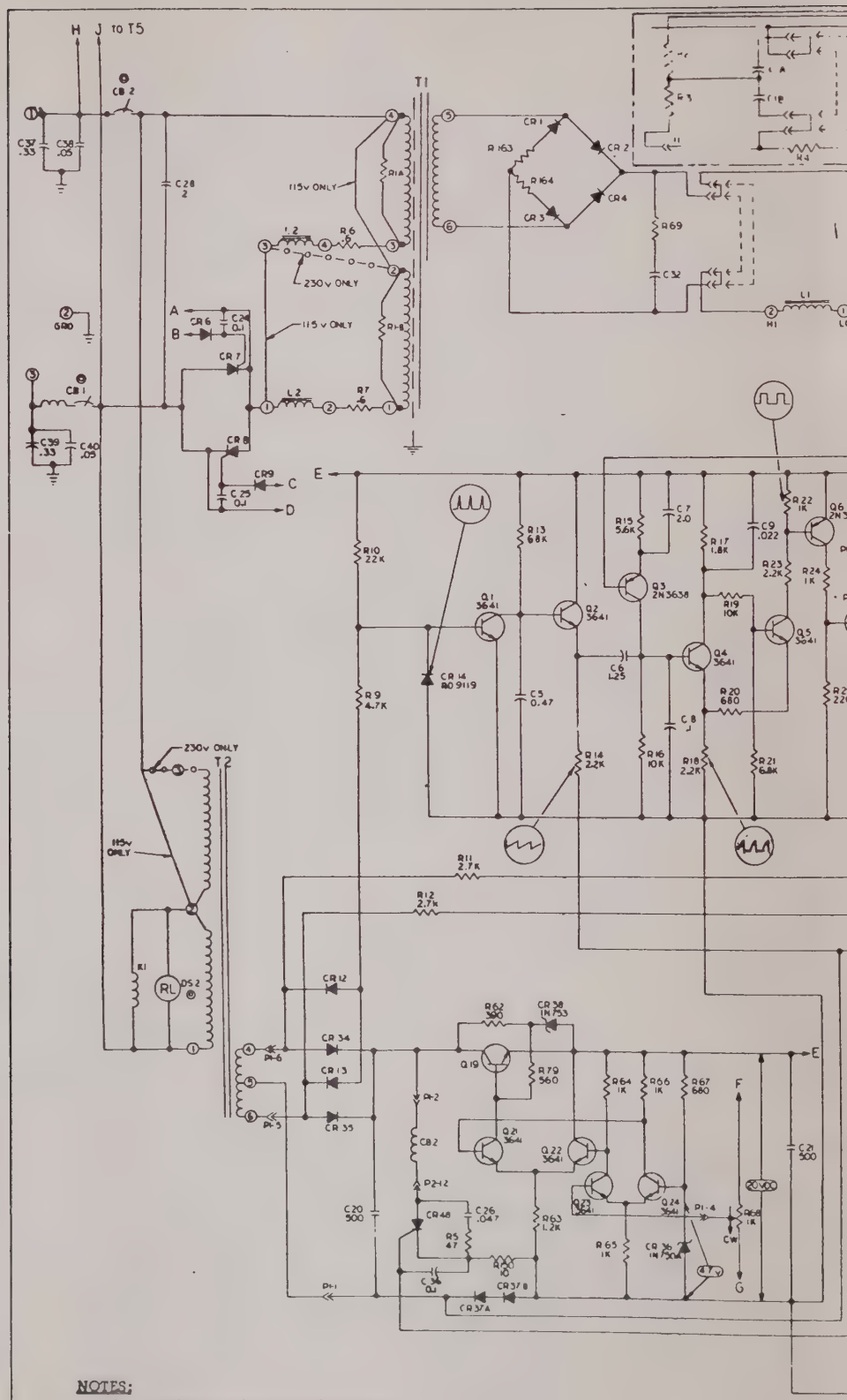
*BCD option (8-4-2-1)

**Ref. para. 4.2.1 / 4.2.2



DAP

Figure 6-1
Digital-to-Analog Programmer
System Schematic Diagram
DWG J165159 Rev. C



NOTES:

1. ⊙ denotes front panel controls.
2. All values expressed in ohms or microfarads unless otherwise specified.
3. All voltages measured at nominal input, nominal output, no load.
4. -0-0- denotes connection for 230 V input only. 230 V input following components change CR7, CR8, & CB1.

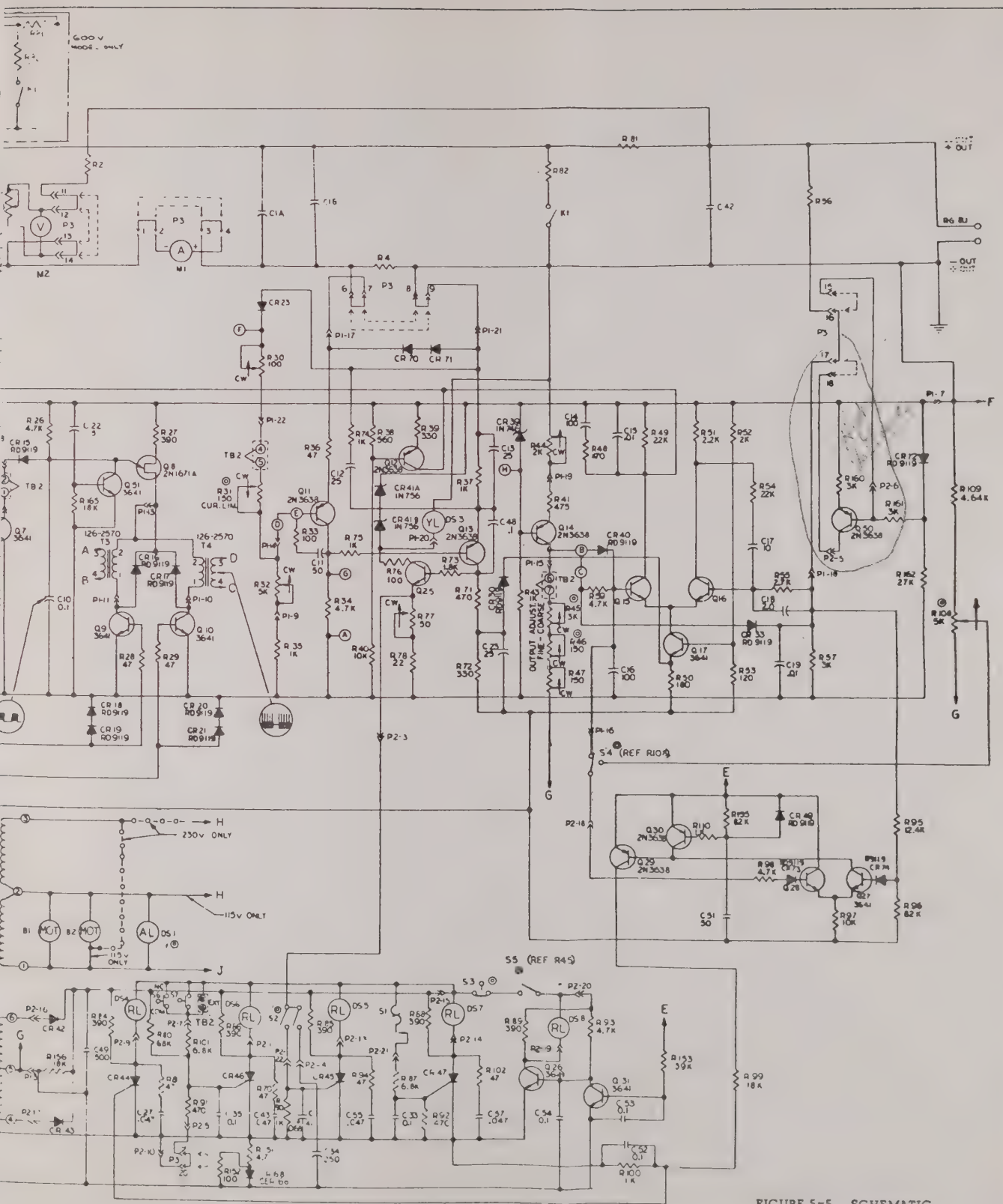
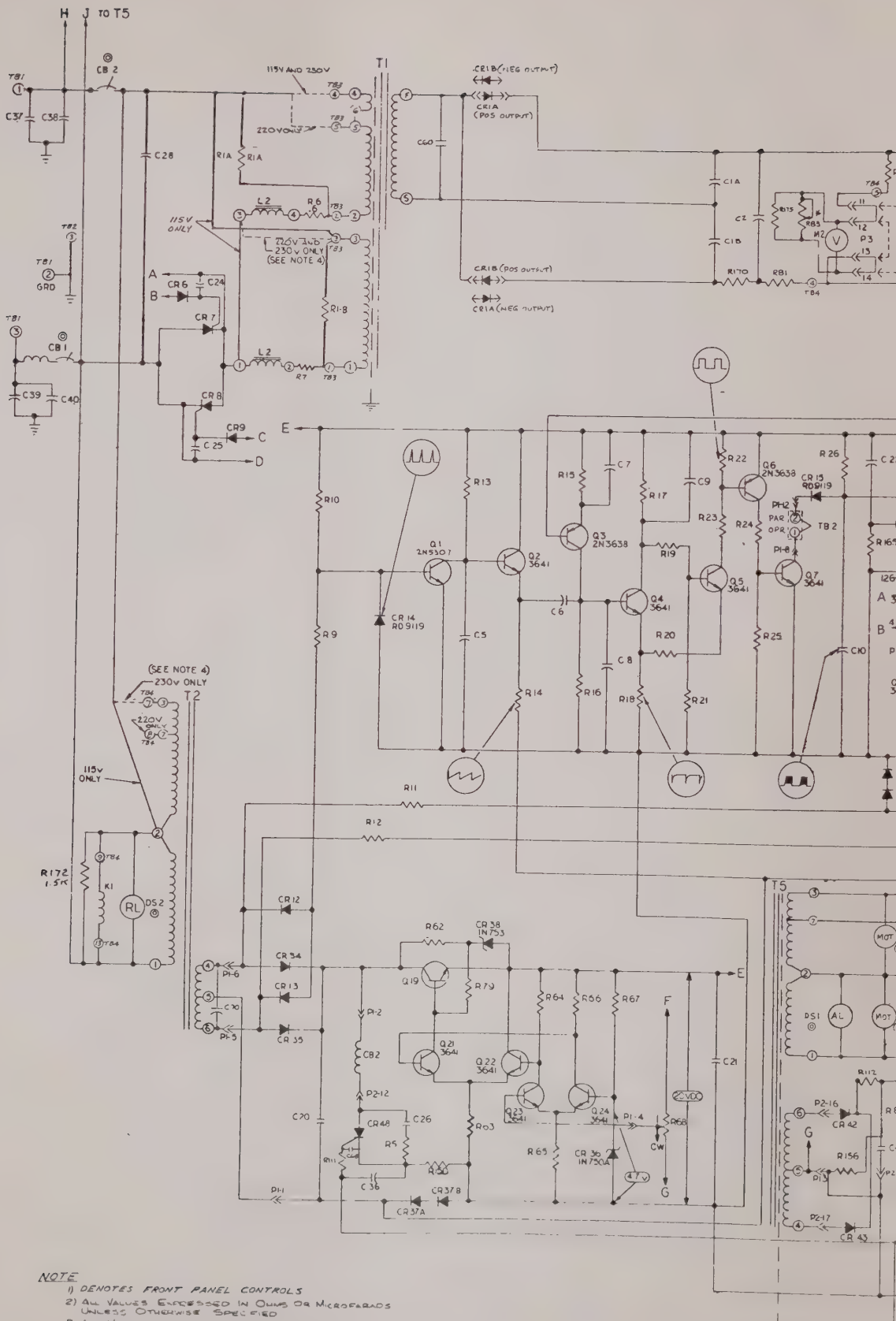


FIGURE 5-5. SCHEMATIC,

DCR 1500-Watt, High Voltage Power Supply

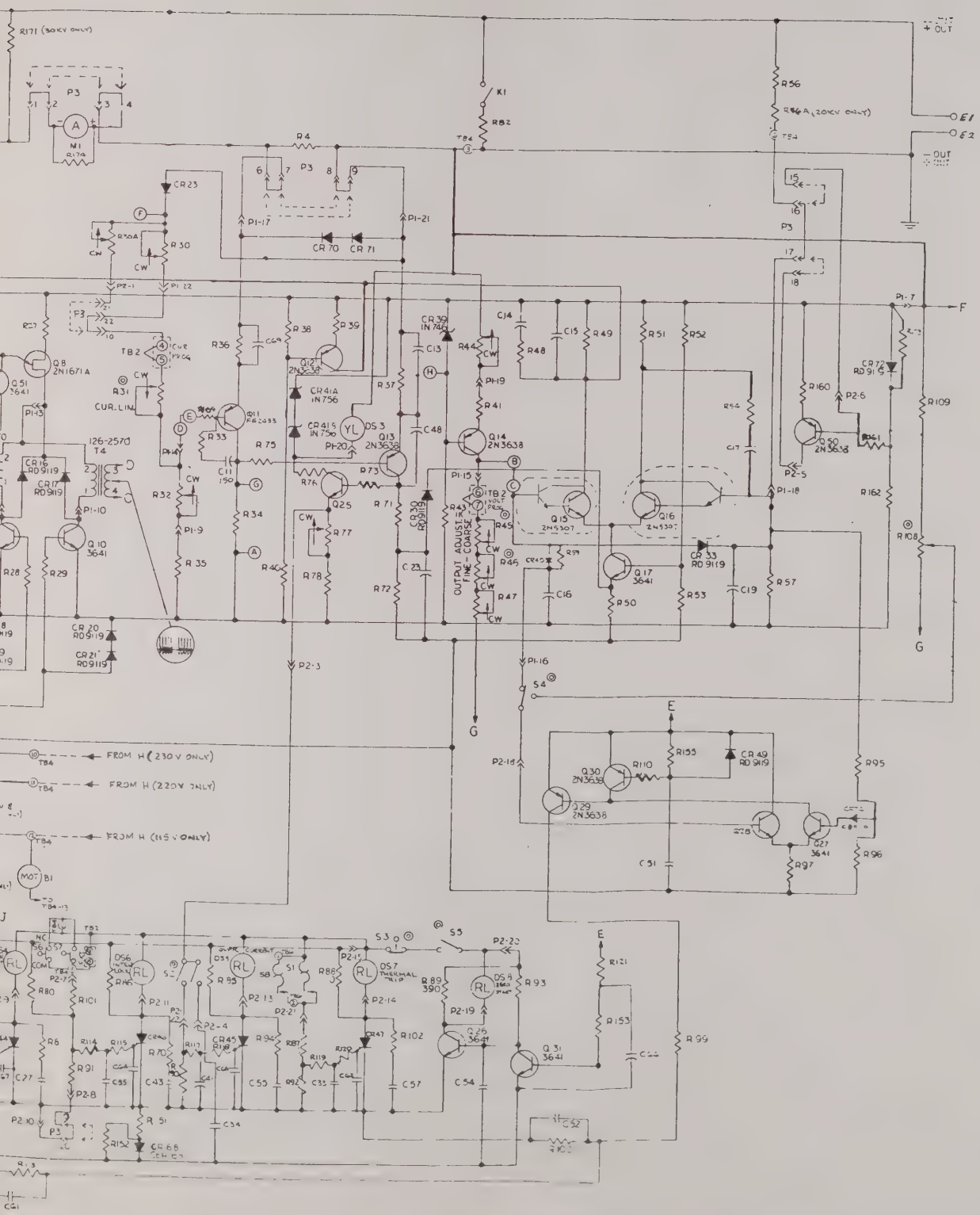


NOTE

1) DENOTES FRONT PANEL CONTROLS
2) ALL VALUES EXPRESSED IN OHMS OR MICROFARADS UNLESS OTHERWISE SPECIFIED
3) ALL VOLTAGES MEASURED AT NOMINAL INPUT, NOMINAL OUTPUT, NO LOAD
4) THE 230V CONNECTIONS, ARE *M1 FACTORY MODIFICATIONS
5) POLARITY SHOWN IS POSITIVE OUTPUT.

230 V INPUT FOLLOWING COMPONENTS CHANGE CR7, CR9, & CB1

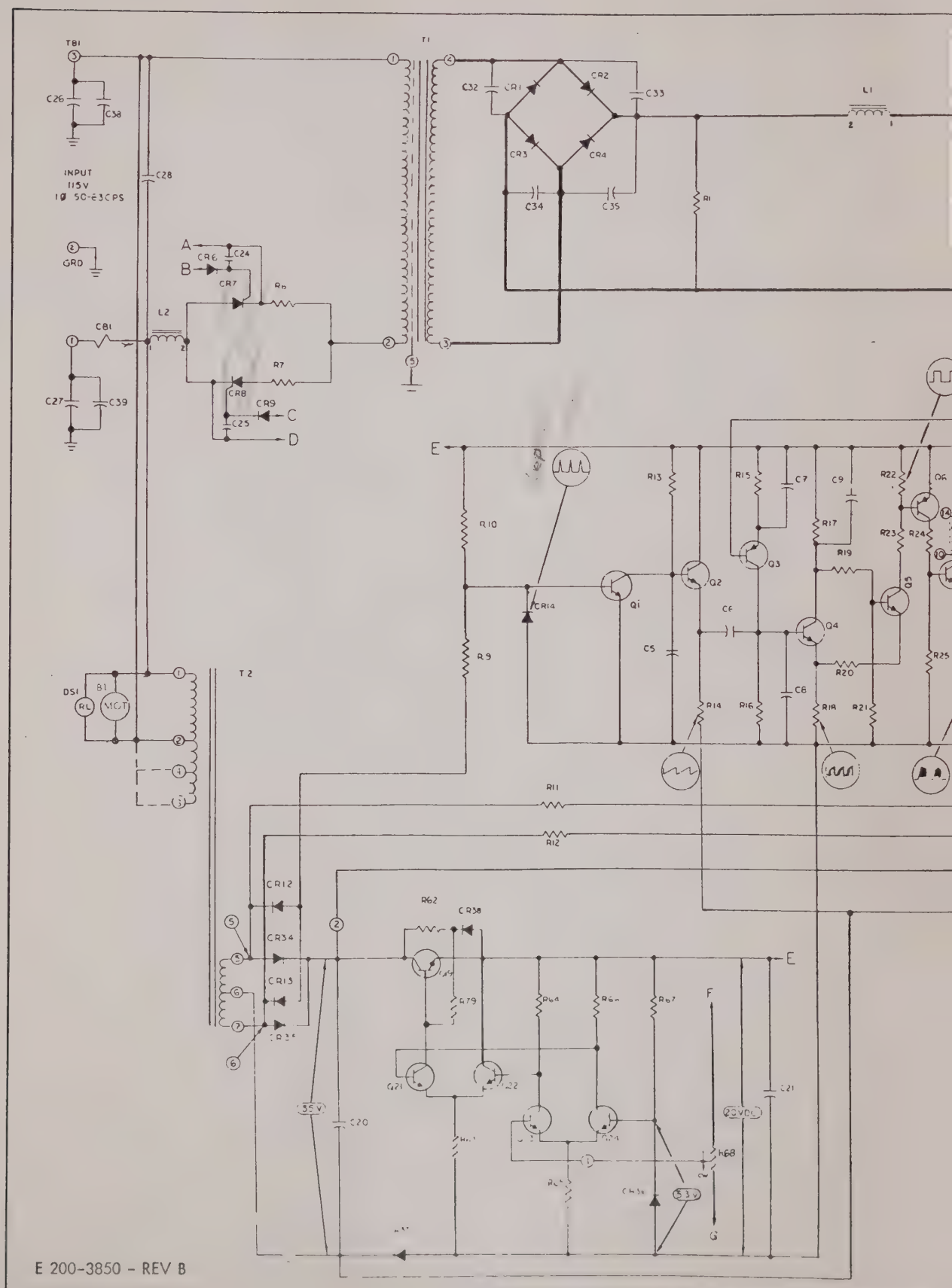
* RB3 NOT APPLICA

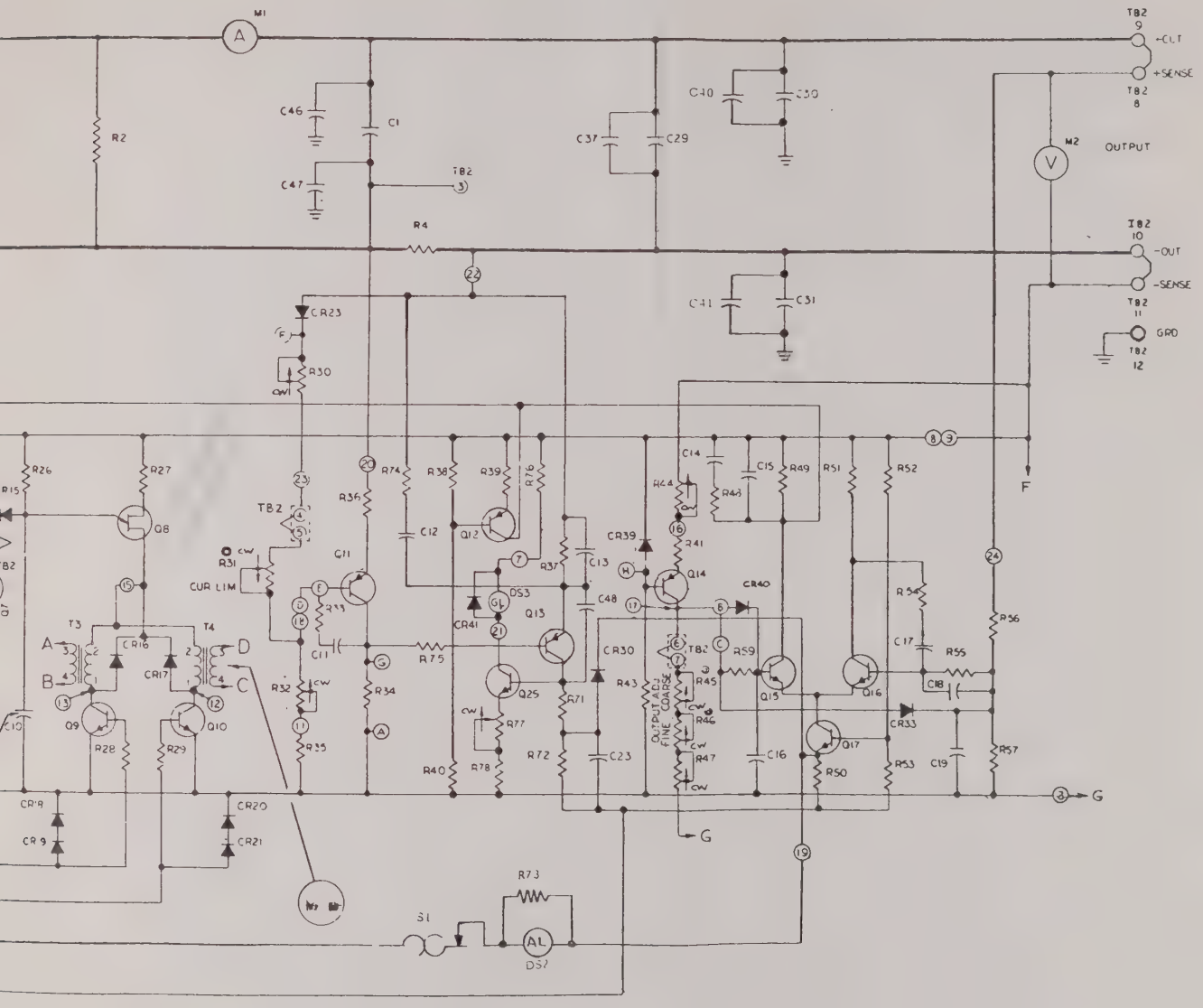


SERIAL NO 100 TO ____

DCR HIGH VOLTAGE MODELS 12KV 20KV. 30KV.

E TO 30KV UNIT


TB1
T1
C26
C38
INPUT
115V
1Ø 50-63CPS
C28
GRD
A
B
CR6
C24
CR7
R6
L2
C81
R7
CR8
CR9
C25
C
D
C27
C39
C32
CR1
CR2
C33
CR3
CR4
C34
C35
R1
L1
E
R10
R13
R15
C7
C9
R22
Q6
R17
R23
R24
R19
Q3
Q2
Q5
Q1
CR14
C6
Q4
C5
R9
R20
R25
R14
R16
C8
R18
R21
T2
DS1
B1
RL
MOT
R11
R12
CR12
R62
CR38
CR34
CR13
CR33
R79
R64
R66
R67
F
Q21
Q22
35V
C20
C21
20VDC
R68
53V
G
E 200-3850 - REV B

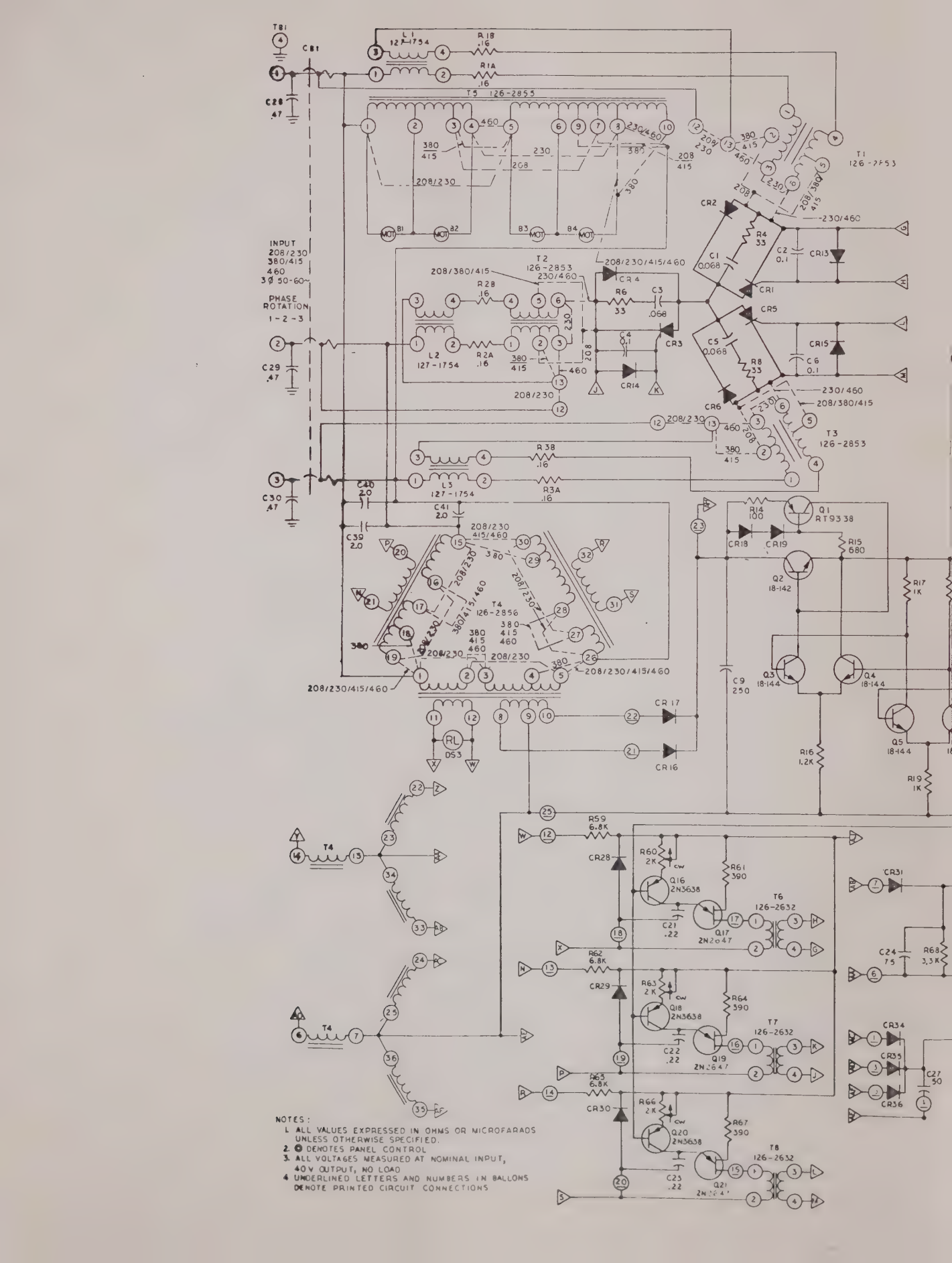


NOTES

1. ⊙ DENOTES FRONT PANEL
2. ALL VOLTAGES MEASURED AT NOMINAL INPUT, NOMINAL OUTPUT AND NO LOAD.

DCRA 10

FIGURE 5-4. SCHEMATIC DIAGRAM



NOTES:
1. ALL VALUES EXPRESSED IN OHMS OR MICROFARADS UNLESS OTHERWISE SPECIFIED.
2. ⊙ DENOTES PANEL CONTROL
3. ALL VOLTAGES MEASURED AT NOMINAL INPUT, 40 V OUTPUT, NO LOAD
4. UNDERLINED LETTERS AND NUMBERS IN BALLONS DENOTE PRINTED CIRCUIT CONNECTIONS

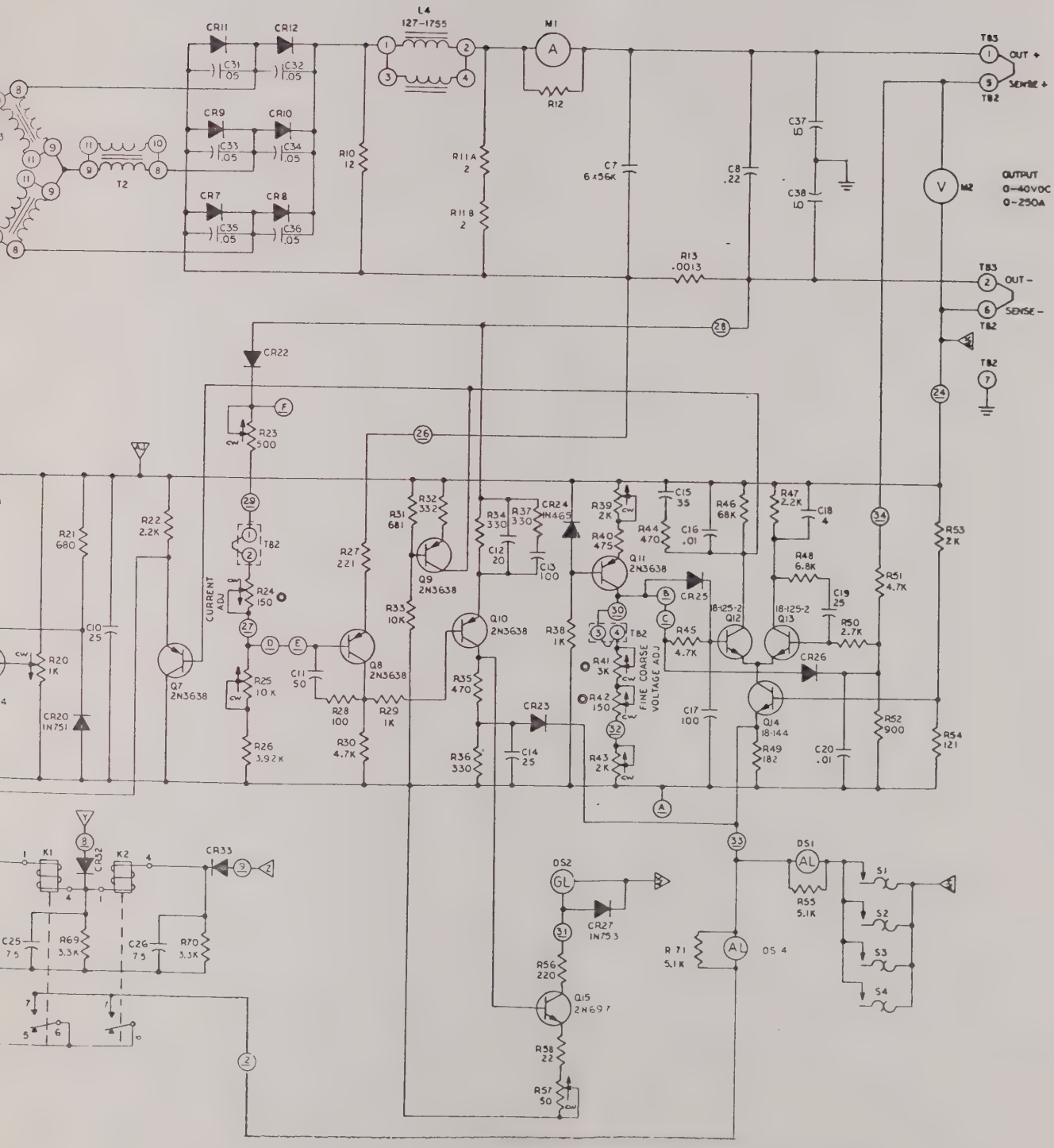
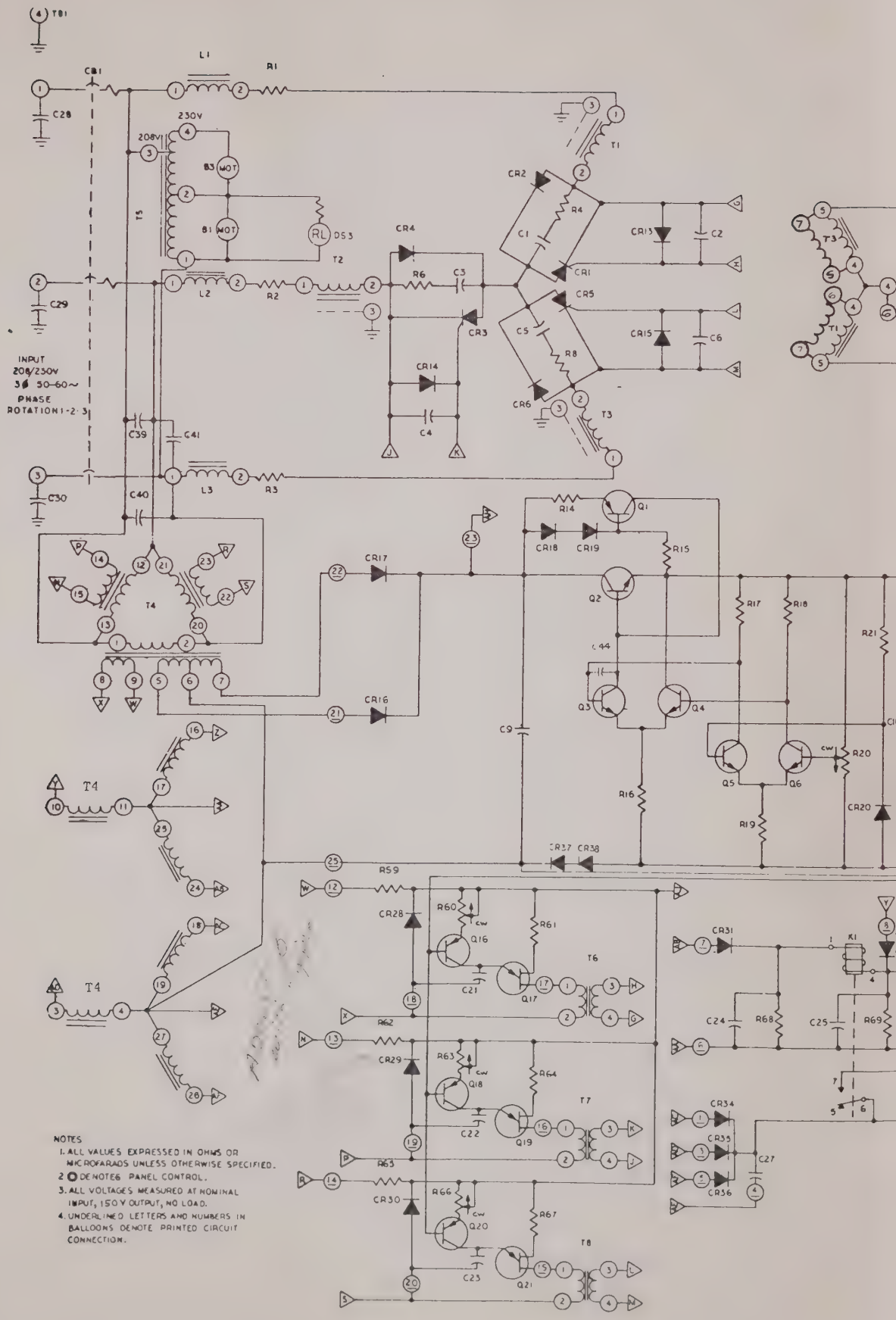


FIGURE 5-3. Unit Schematic, DCR 40-250A 30



NOTES

1. ALL VALUES EXPRESSED IN OHMS OR MICROFARADS UNLESS OTHERWISE SPECIFIED.
2. ○ DENOTES PANEL CONTROL.
3. ALL VOLTAGES MEASURED AT NOMINAL INPUT, 150 V OUTPUT, NO LOAD.
4. UNDERLINED LETTERS AND NUMBERS IN BALLOONS DENOTE PRINTED CIRCUIT CONNECTION.

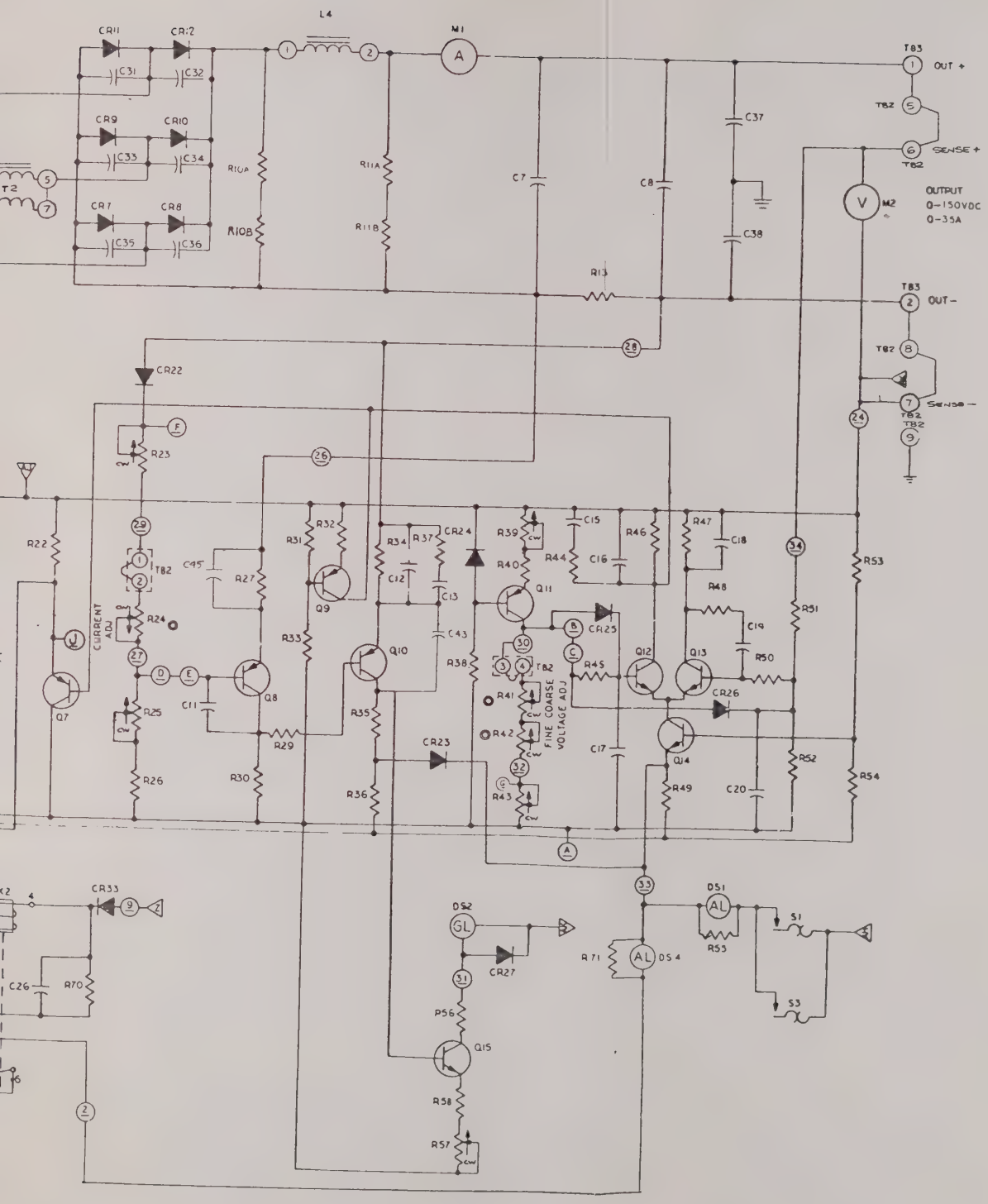
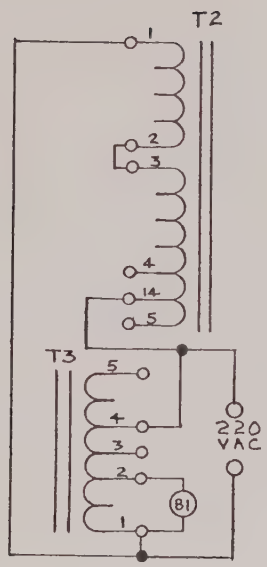
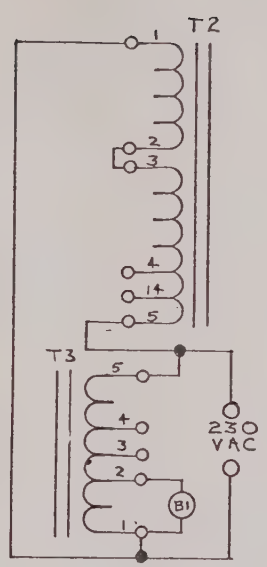
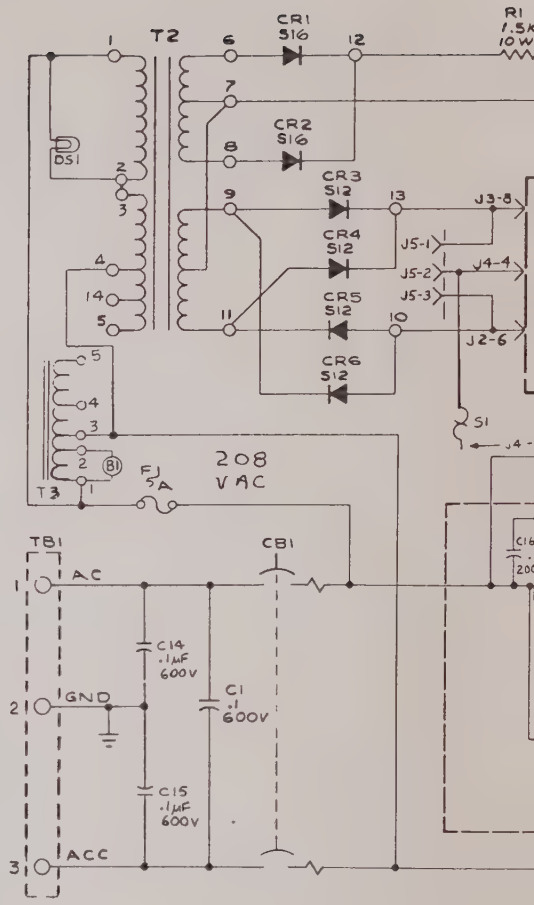
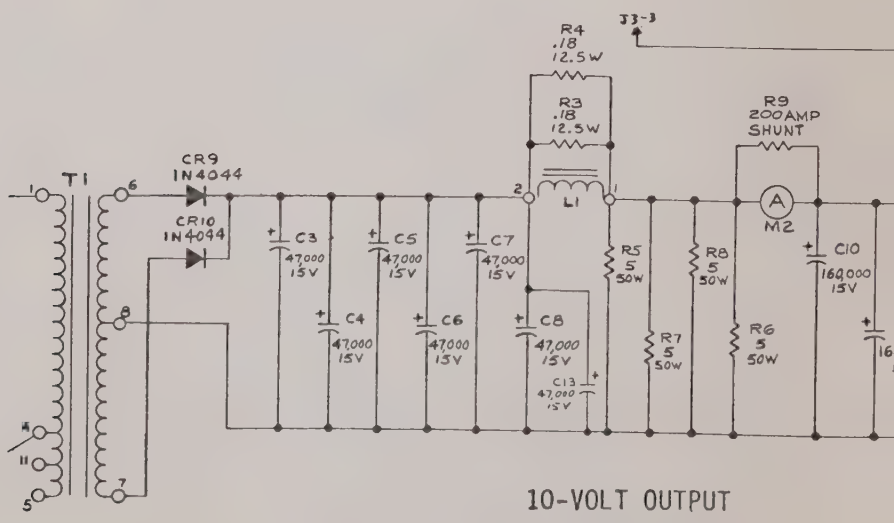


FIGURE 7-2. UNIT SCHEMATIC - MODEL DCR 150-35A 30









10-VOLT OUTPUT

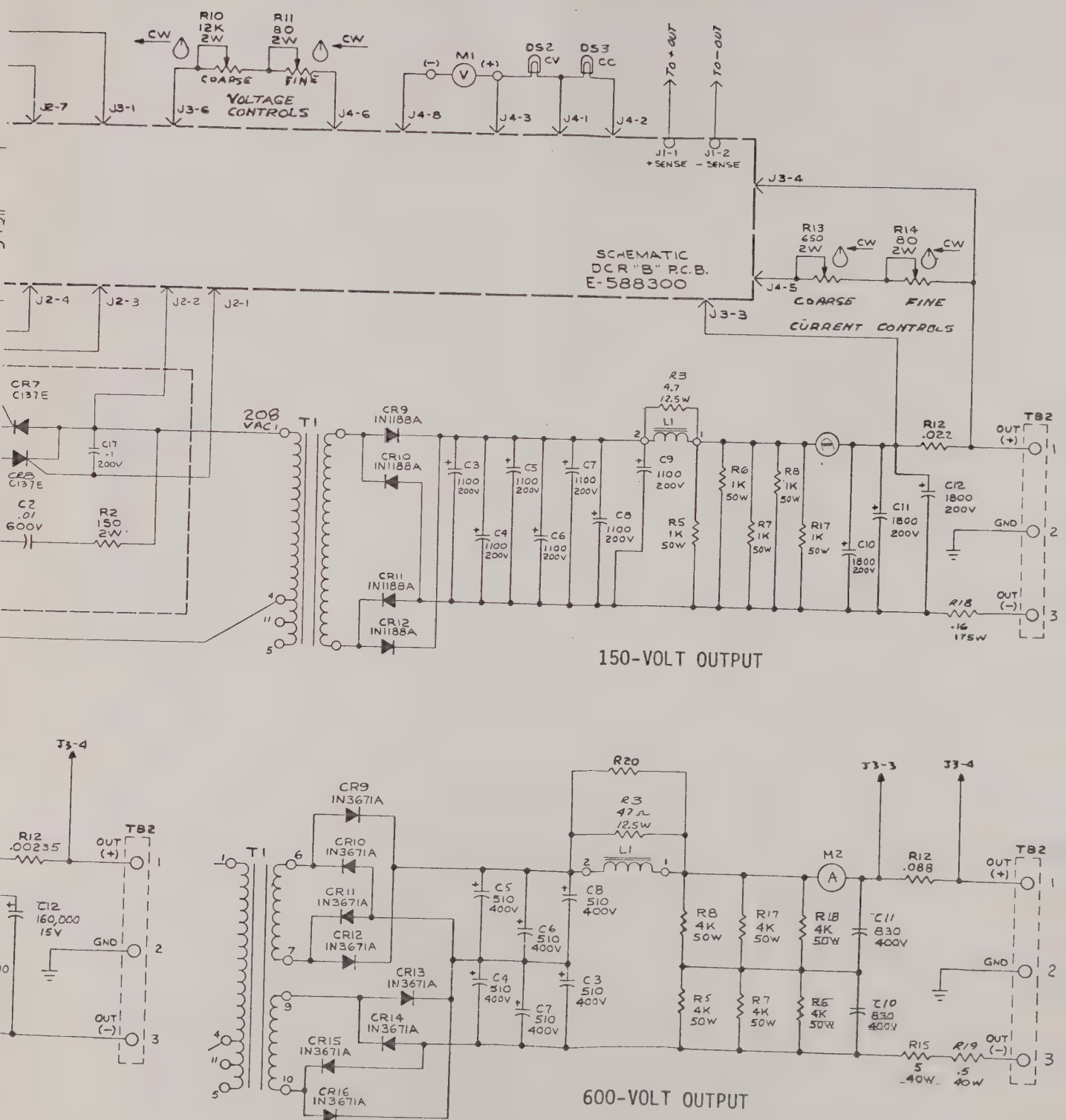
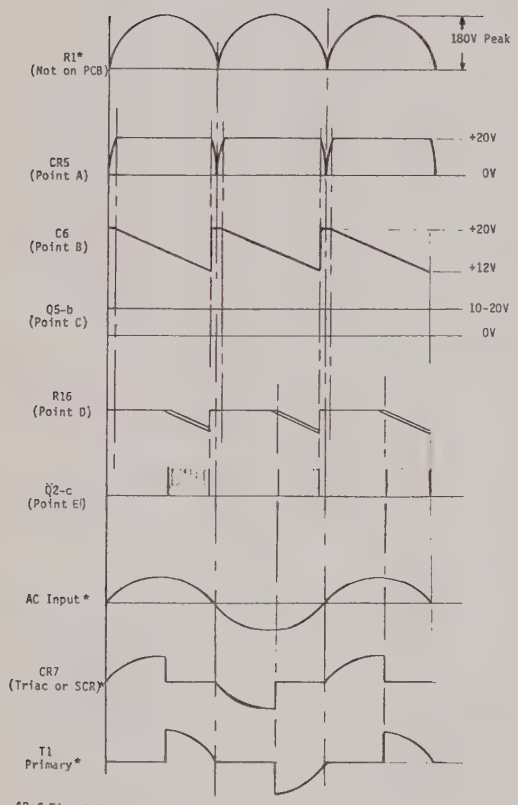
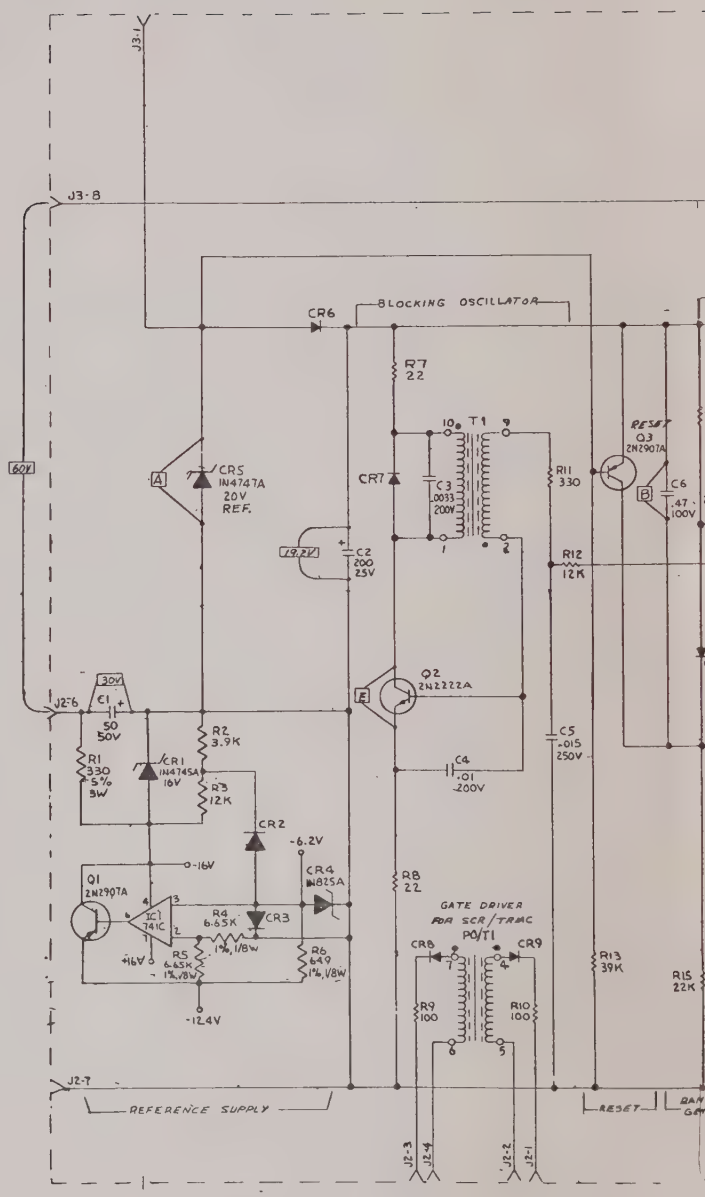


Figure 6-4
DCR-B Main Assembly Schematic Diagram
(Typical 2700 Watt)

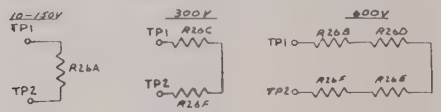


*Ref Fig. 6-2

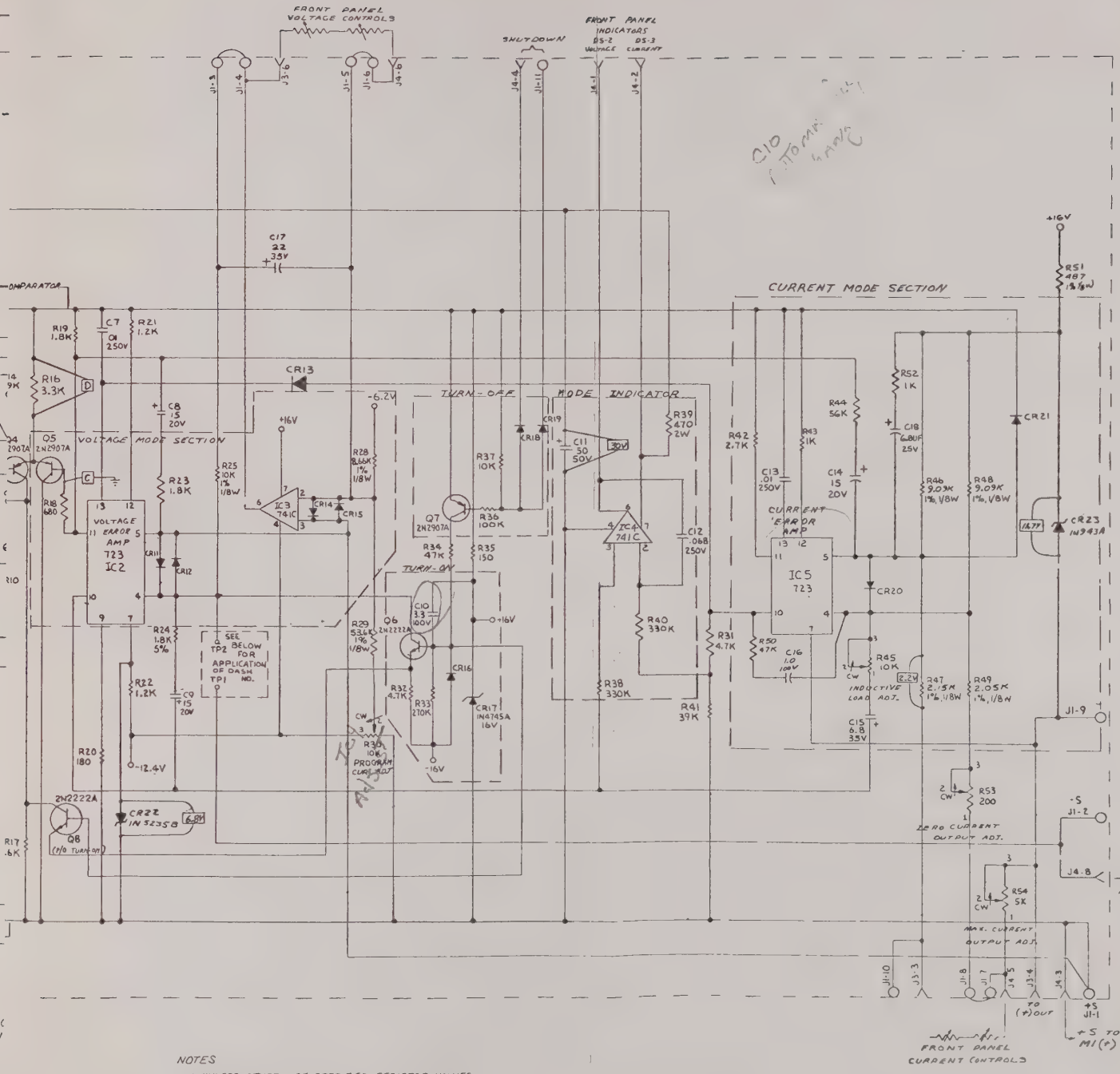
Timing Pulse Waveforms



UNIT	R26A	R26B	R26C	R26D	R26E	R26F
10-40	40KΩ±1%	—	—	—	—	—
20-25	20KΩ±1%	—	—	—	—	—
40-13	40KΩ±1%	—	—	—	—	—
60-9	60KΩ±1%	—	—	—	—	—
80-6	80KΩ±1%	—	—	—	—	—
150-3	150KΩ±1%	—	—	—	—	—
300-1.5	—	—	150KΩ±1%	—	—	150KΩ±1%
600-.75	—	150KΩ±1%	—	150KΩ±1%	150KΩ±1%	150KΩ±1%



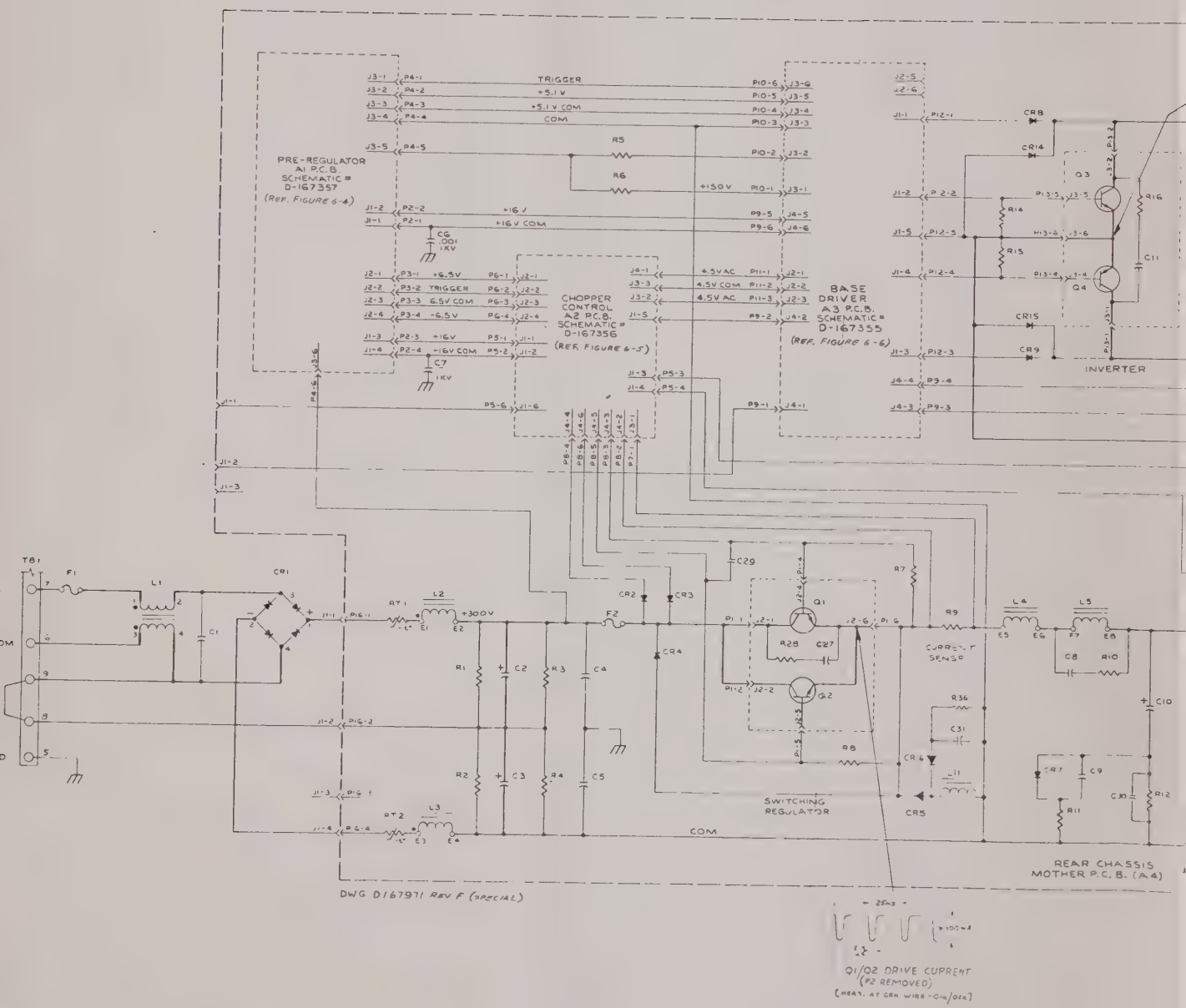
DWG. E588300 Rev. E (Special)



NOTES

1. UNLESS OTHERWISE SPECIFIED RESISTOR VALUES ARE IN OHMS.
2. UNLESS OTHERWISE SPECIFIED ALL RESISTORS ARE 1/2 WATT, ±10%.
3. UNLESS OTHERWISE SPECIFIED CAPACITOR VALUES ARE IN MICROFARADS.
4. UNLESS OTHERWISE SPECIFIED ALL DIODES ARE 512.

Figure 6-1
DCR-B PCB Schematic Diagram
(All Models)


PRE-REGULATOR A1 P.C.B. SCHEMATIC = D-167357 (REF. FIGURE 6-4)
CHOPPER CONTROL A2 P.C.B. SCHEMATIC = D-167356 (REF. FIGURE 6-5)
BASE DRIVER A3 P.C.B. SCHEMATIC = D-167355 (REF. FIGURE 6-6)
TRIGGER
+5.1 V
+5.1 V COM
COM
+16 V
+16 V COM
+150 V
4.5 V AC
4.5 V COM
-6.5 V
+6.5 V
+300 V
INVERTER
SWITCHING REGULATOR
CURRENT SENSE
REAR CHASSIS MOTHER P.C.B. (A4)
DWG D167971 REV F (SPECIAL)
Q1/Q2 DRIVE CURRENT (P2 REMOVED)
[MEAS. AT GRN WIRE - Q1a/Q2a]

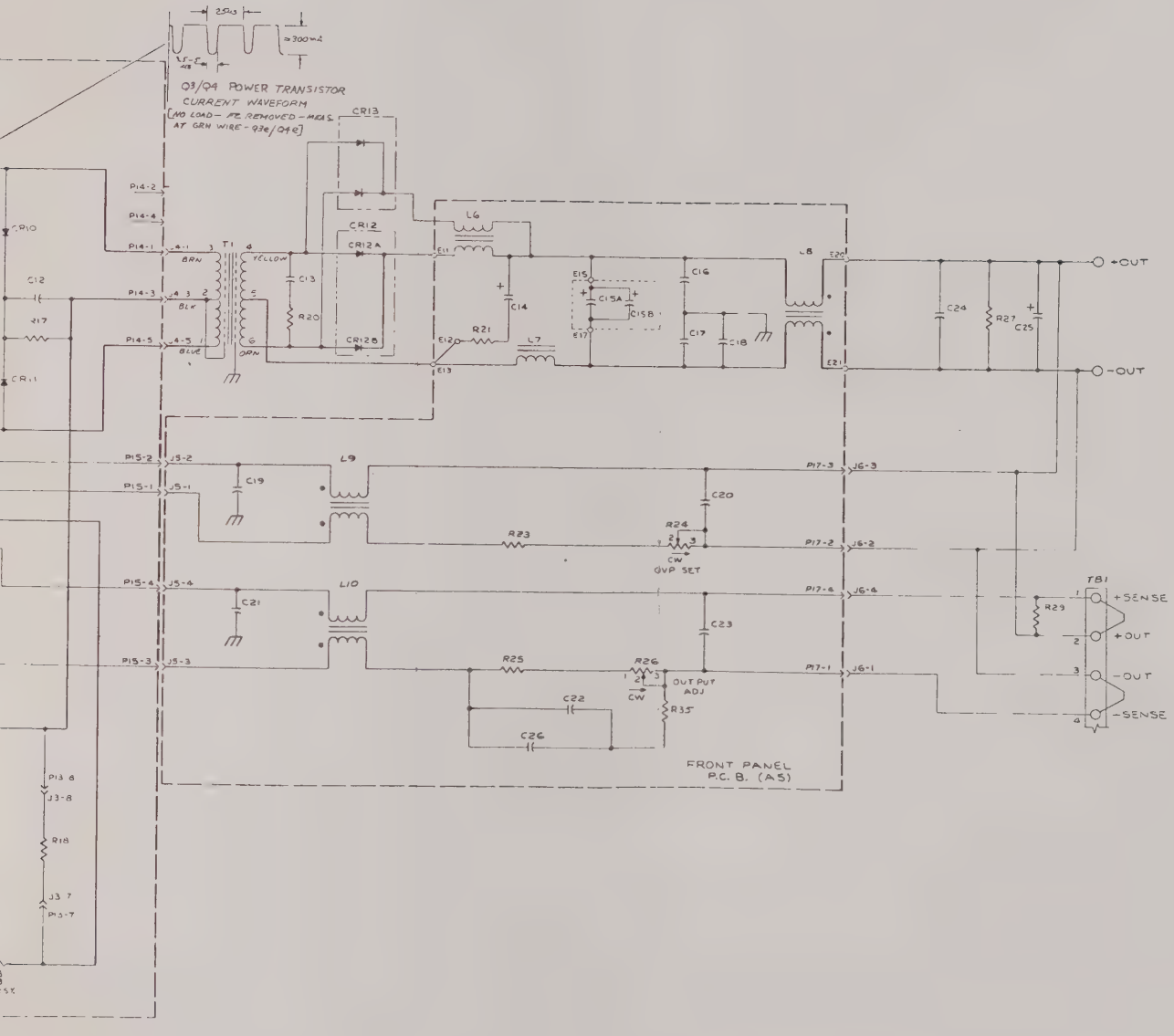
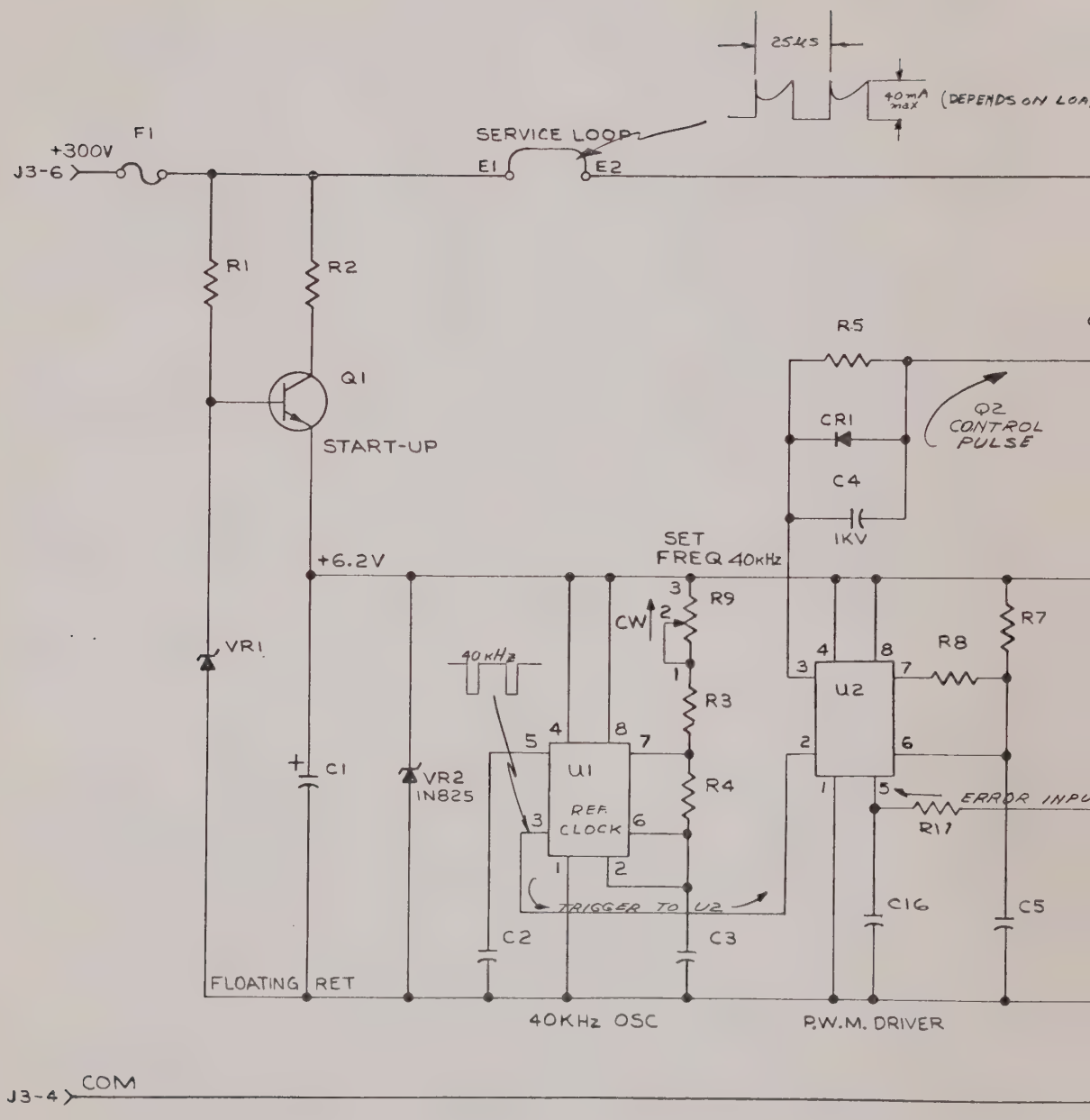
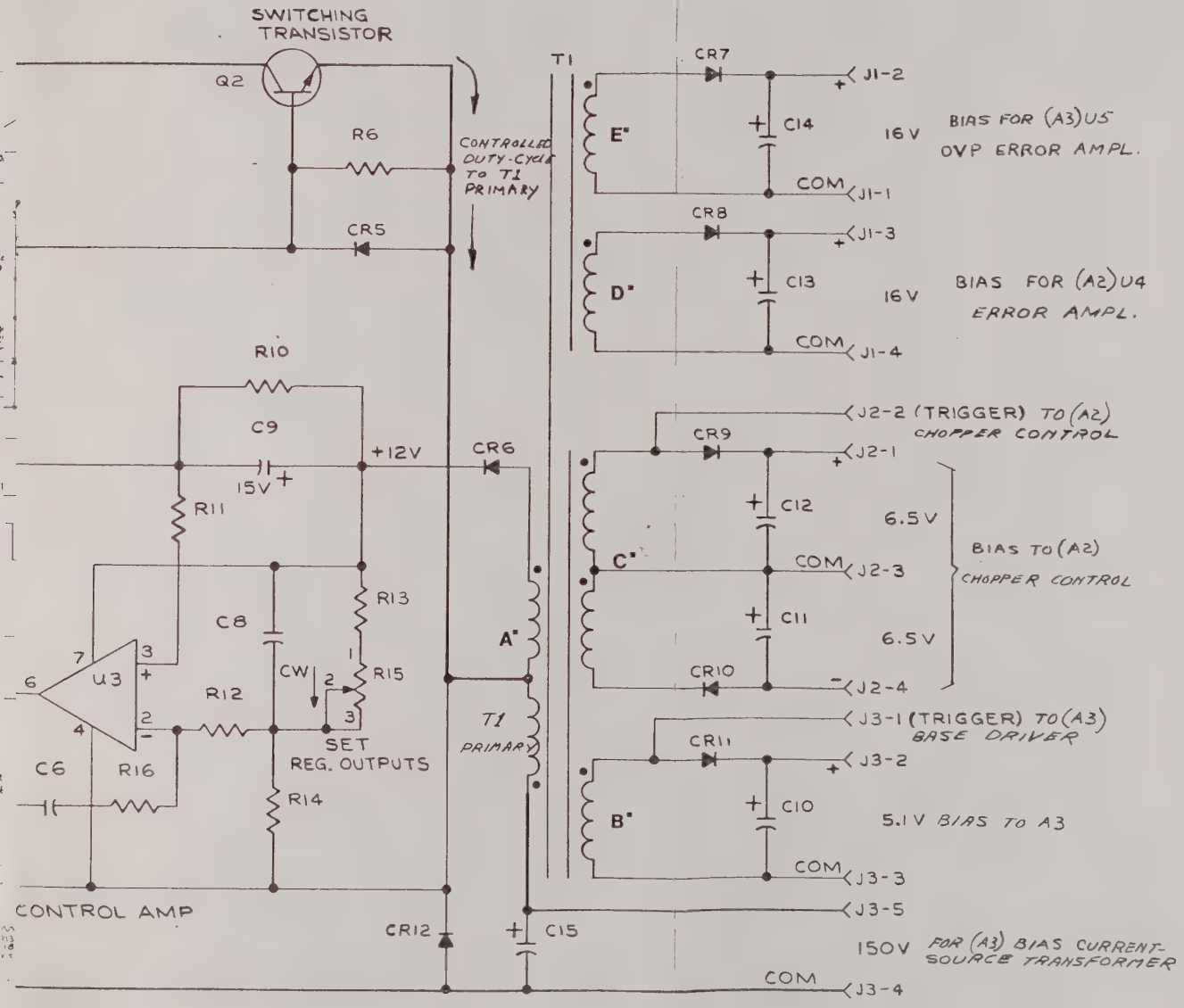


Figure 6-3
SSD Module IIIA System Schematic Diagram

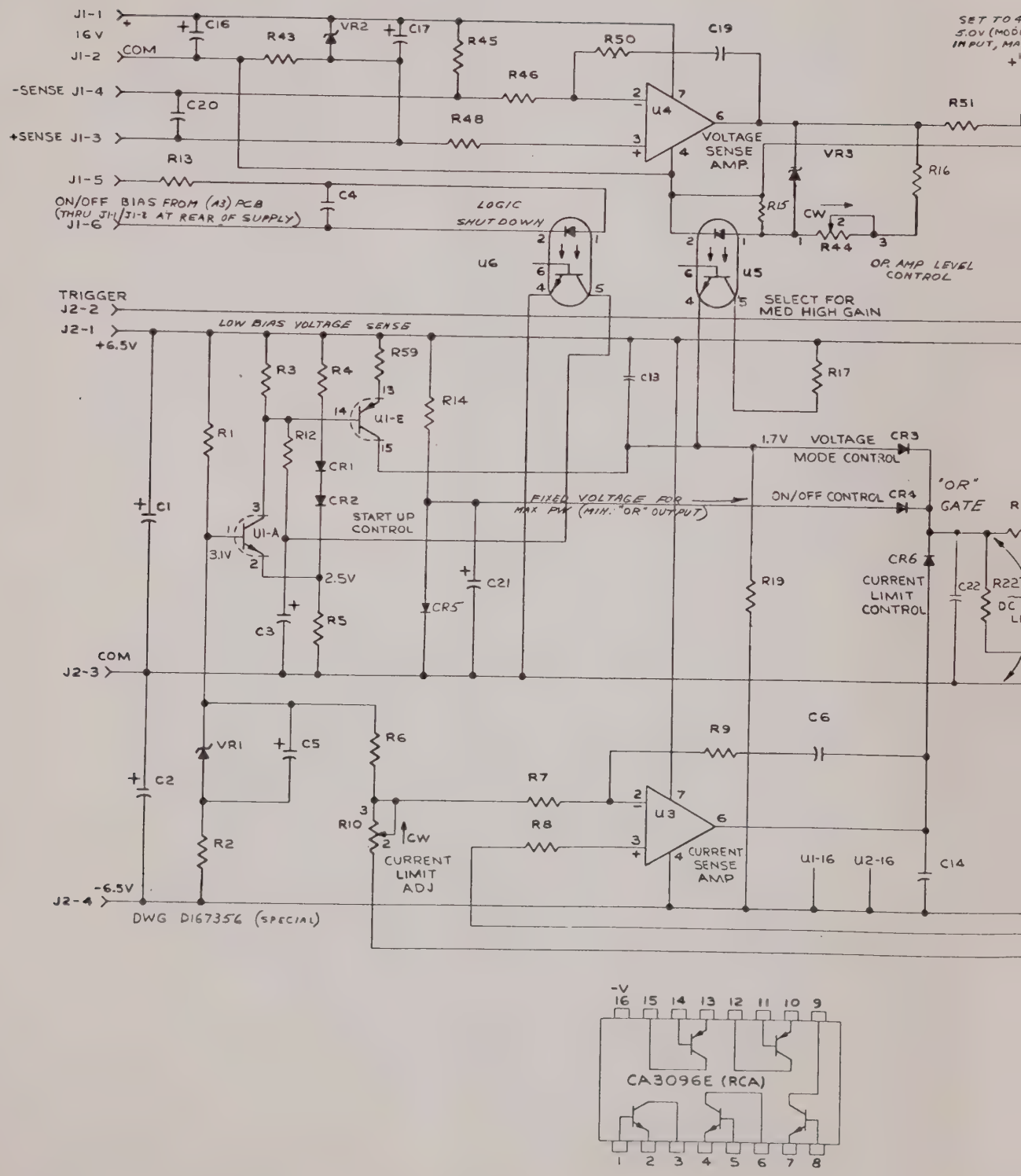


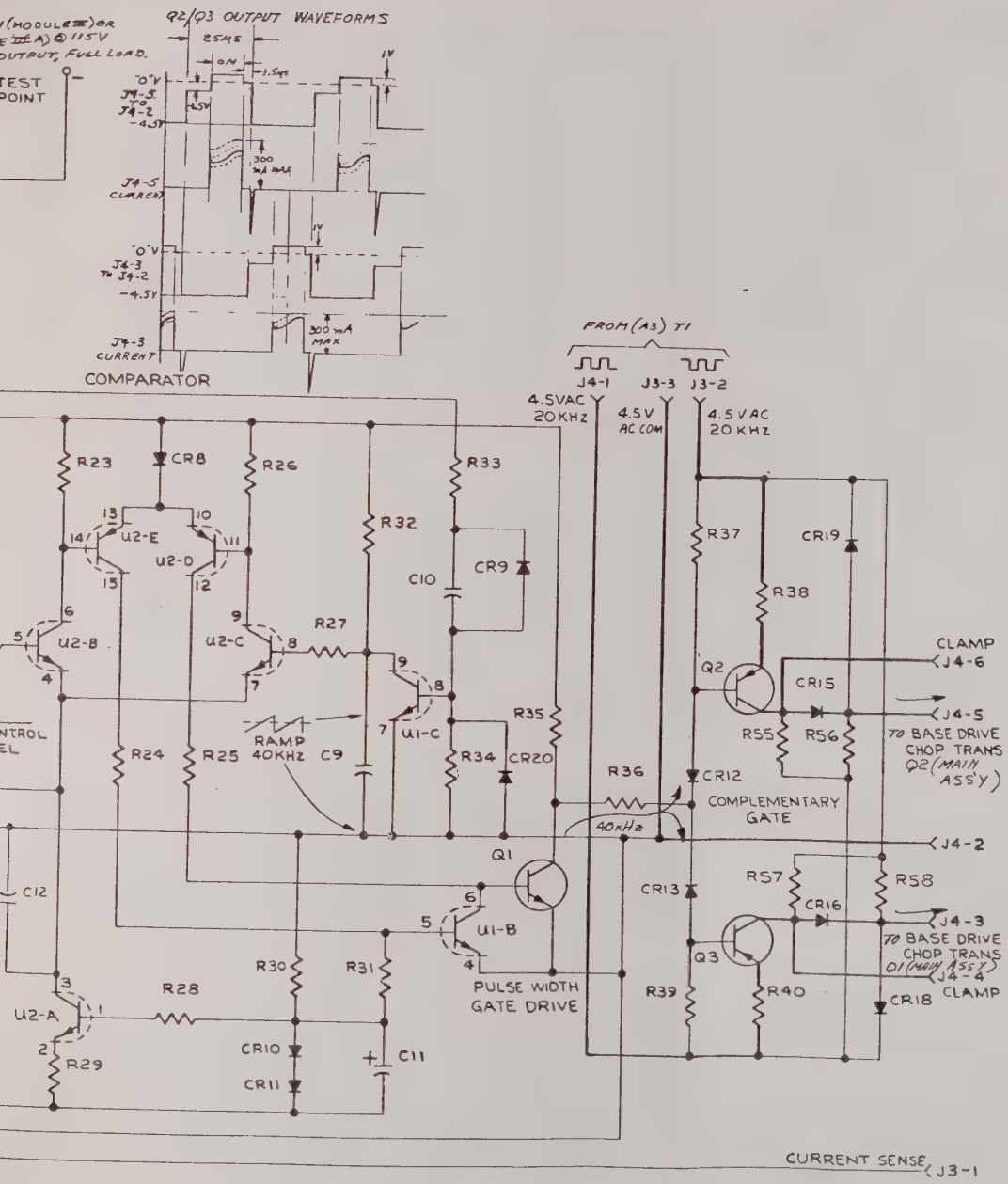
DWG. D 167357 REV D (SPECIAL)



EXTERNAL 12 ✓
CATHODE CR6
CATHODE CR12
TO CHECK CLOSE

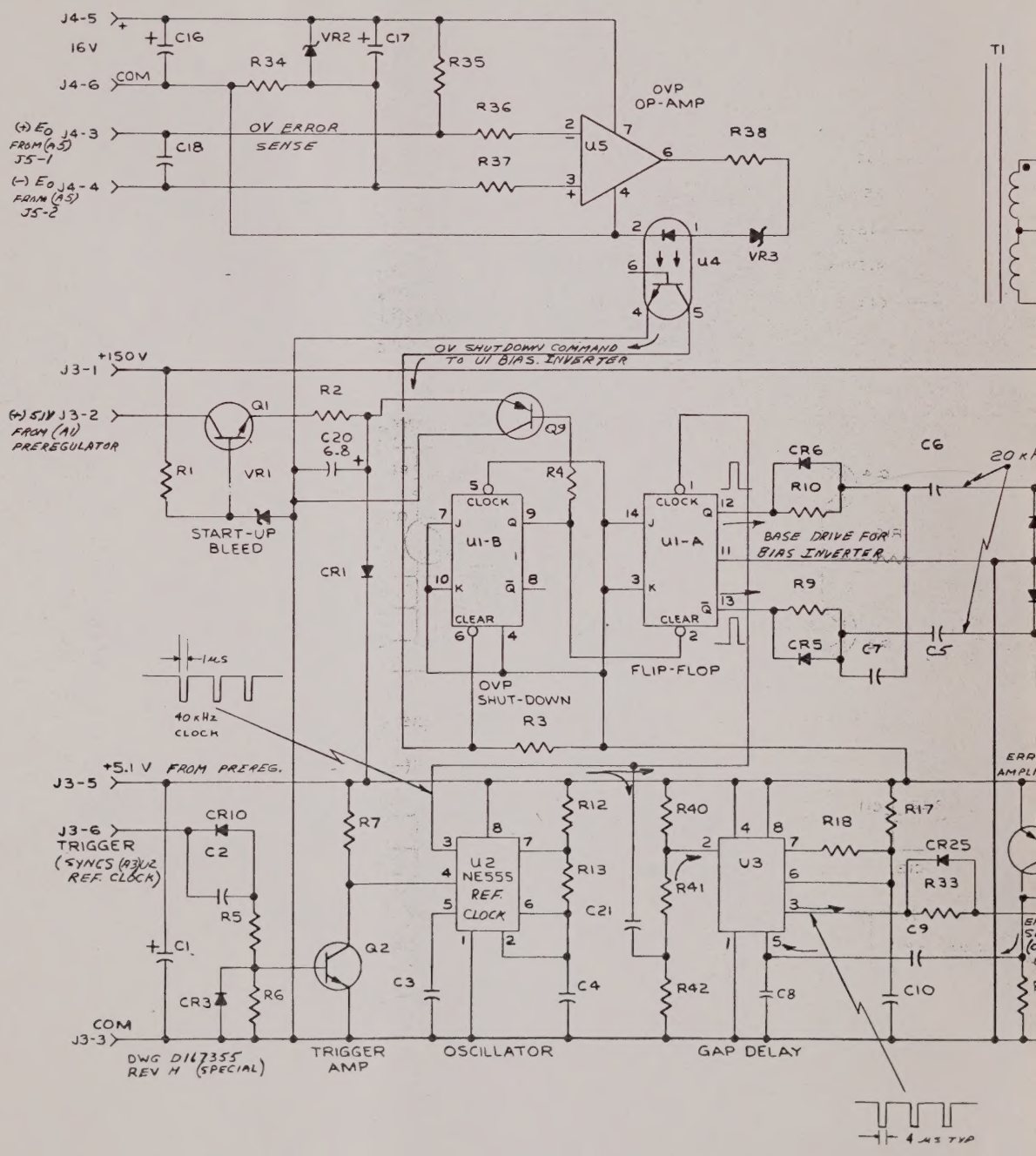
Figure 6-4
SSD *(A1) Preregulator Circuit Board Diagram Module III and IIIA*


J1-1
16V
J1-2
COM
-SENSE J1-4
+SENSE J1-3
J1-5
J1-6
ON/OFF BIAS FROM (A3) PCB
(THRU J1-1/J1-2 AT REAR OF SUPPLY)
C16
C17
VR2
R43
R45
R46
R48
R50
C19
C20
R13
C4
U4
VOLTAGE SENSE AMP.
R51
VR3
R16
R15
CW
R44
OP. AMP LEVEL CONTROL
LOGIC SHUTDOWN
U6
U5
SELECT FOR MED HIGH GAIN
TRIGGER
J2-2
J2-1
+6.5V
LOW BIAS VOLTAGE SENSE
R59
R3
R4
R14
U1-E
R1
R12
CR1
CR2
START UP CONTROL
C13
R17
1.7V VOLTAGE MODE CONTROL
CR3
"OR" GATE
FIXED VOLTAGE FOR MAX PW (MIN. "OR" OUTPUT)
ON/OFF CONTROL
CR4
C1
U1-A
3.1V
2.5V
C3
R5
CR5
C21
R19
CR6
CURRENT LIMIT CONTROL
C22
COM
J2-3
VR1
C5
R6
C2
R2
R10
CW
CURRENT LIMIT ADJ
R7
R8
R9
C6
U3
CURRENT SENSE AMP
U1-16
U2-16
C14
-6.5V
J2-4
DWG D167356 (SPECIAL)
-V
16 15 14 13 12 11 10 9
CA3096E (RCA)
1 2 3 4 5 6 7 8



SSD (A2) *Chopper Control Circuit Board Diagram*
Madules III and IIIA

Figure 6-5


J4-5
16V
C16
VR2
C17
R34
R35
J4-6
COM
R36
OVP
OP-AMP
(+) Eo J4-3
FROM (A5)
J5-1
OV ERROR
SENSE
C18
U5
R38
R37
(-) Eo J4-4
FROM (A5)
J5-2
VR3
U4
OV SHUTDOWN COMMAND
TO U1 BIAS INVERTER
+150V
J3-1
(+) 5.1V J3-2
FROM (A1)
PREREGULATOR
Q1
R2
C20
6.8
Q9
R1
VR1
R4
CR6
R10
C6
START-UP
BLEED
CR1
U1-B
U1-A
BASE DRIVE FOR
BIAS INVERTER
R9
CR5
C7
C5
1μs
40KHz
CLOCK
OVP
SHUT-DOWN
R3
FLIP-FLOP
+5.1 V FROM PREREG.
J3-5
J3-6
TRIGGER
(SYNCS (A3)U2
REF. CLOCK)
CR10
C2
R7
R12
R40
R17
R18
CR25
U2
NE555
REF.
CLOCK
U3
R13
R41
R33
R5
C21
C9
C1
Q2
C3
C4
R42
C8
C10
CR3
R6
COM
J3-3
DWG D167355
REV H (SPECIAL)
TRIGGER
AMP
OSCILLATOR
GAP DELAY
4 μs TYP

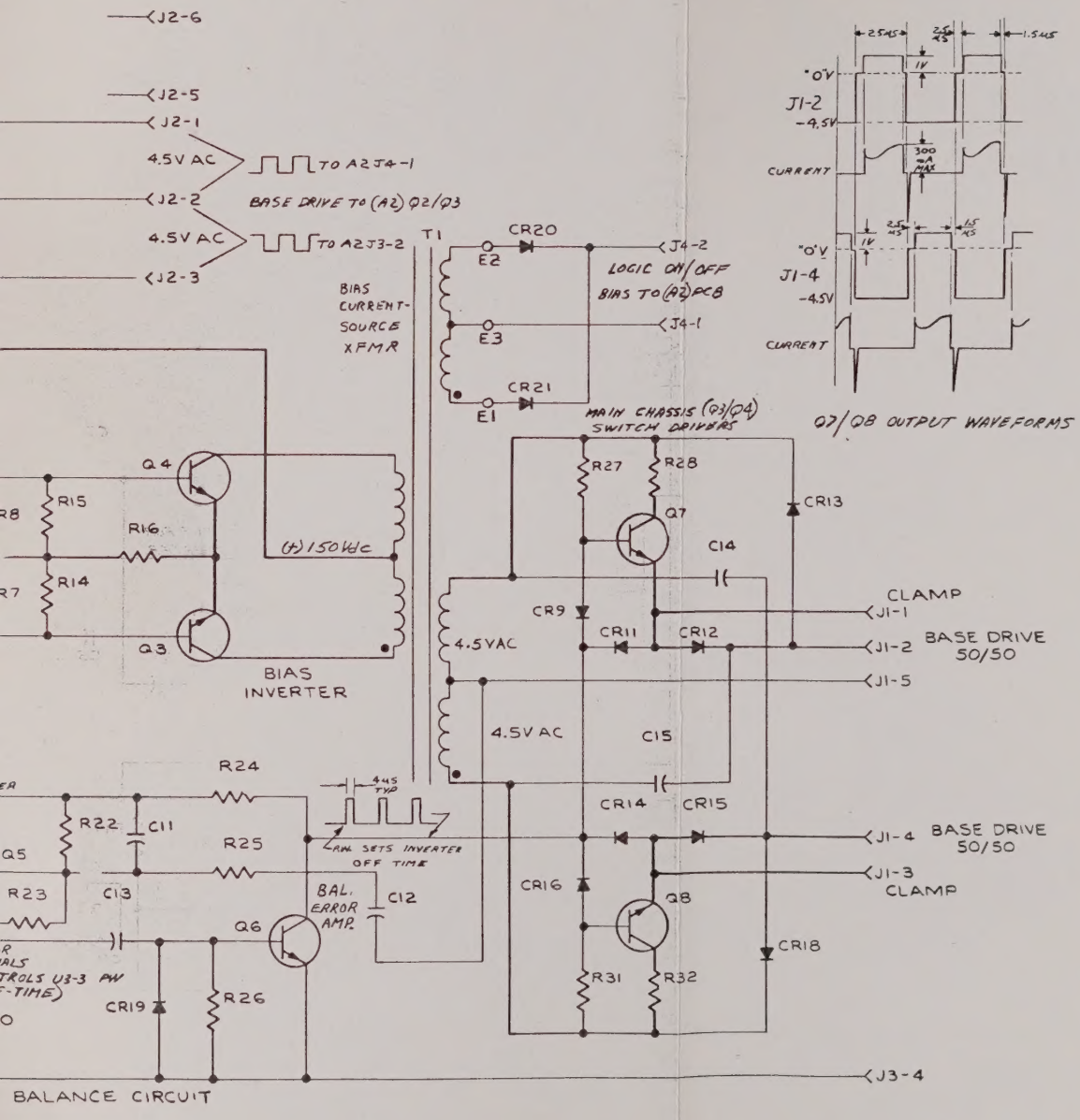


Figure 6-6
SSD (A3) *Base Driver Circuit Board Diagram*
Modules III and IIIA

SORENSEN
POWER SUPPLIES

A Raytheon Company